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Subsurface Exploration, Geologic Hazards,
and Geotechnical Engineering Report

PORCH AND PARK

Redmond, Washington

Prepared for

MAINSTREET PROPERTY GROUP, LLC

August 9, 2019
Revised November 1, 2019
Project No. 20180378E001

Associated Earth Sciences, Inc.
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MainStreet Property Group, LLC
12332 NE 115th Place
Kirkland, Washington 98033

Attention: Ms. Kim Faust

Subject: Subsurface Exploration, Geologic Hazards, and Geotechnical Engineering Report
Porch and Park
16001 - 16005 NE Redmond Way
Redmond, Washington

Dear Ms. Faust:

Associated Earth Sciences, Inc. (AESI) is pleased to present this report providing the results of our geotechnical engineering study for the referenced project. Explorations completed for this study included auger borings and Geoprobe explorations. We were also provided with logs of on-site and site-adjacent explorations completed previously during the design phase of the adjacent City park, and relied on those explorations by others. We previously presented a draft geotechnical report dated October 2, 2018, and a supplementary geotechnical study dated March 14, 2019; these earlier geotechnical studies are superseded by this report. The current revisions to this report reflect responses to City of Redmond comments dated September 17, 2019. AESI also prepared a Phase I Environmental Site Assessment report for the project dated August 29, 2018, and a Phase II Environmental Site Assessment report for the project dated February 26, 2019.

We have enjoyed working with you on this study and are confident that the recommendations presented in this report will aid in the successful completion of your project. If you should have any questions regarding this report or if we can be of additional help to you, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

Kurt D. Merriman, P.E.
Senior Principal Engineer

KDM/ld - 20180378E001-4

SUBSURFACE EXPLORATION, GEOLOGIC HAZARDS, AND GEOTECHNICAL ENGINEERING REPORT

PORCH AND PARK

Redmond, Washington

Prepared for:
MainStreet Property Group, LLC
12332 NE 115th Place
Kirkland, Washington 98033

Prepared by:
Associated Earth Sciences, Inc.
911 5th Avenue
Kirkland, Washington 98033
425-827-7701

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I. PROJECT AND SITE CONDITIONS

1.0 INTRODUCTION

The project site is located at 16001 – 16005 NE Redmond Way, located in Redmond, Washington, and includes Parcel Numbers 779240-0230, 779240-0225, and 779240-0190. The site location is shown on Figure 1, "Vicinity Map." The approximate locations of the exploration borings completed for this study are shown on the "Site and Exploration Plan," Figure 2. This report also relies on explorations previously completed onsite by another consultant. The approximate locations of explorations by others are also shown on Figure 2. Interpretive logs of subsurface explorations are included in the Appendix.

1.1 Purpose and Scope

The purpose of this study was to provide geotechnical engineering recommendations and a liquefaction hazard analysis to be utilized in the design of the project. This study included a review of selected available geologic and geotechnical literature, advancing two exploration borings, advancing fifteen direct-push Geoprobe explorations, and performing geologic studies to assess the type, thickness, distribution, and physical properties of the subsurface sediments and shallow groundwater. Grain-size analysis and moisture content tests were completed on selected soil samples recovered from our exploration borings, and copies of laboratory test results are included in the Appendix. Geotechnical engineering studies were completed to investigate liquefaction potential, establish recommendations for the type of suitable foundations and floors, formulate stone column and augercast pile geotechnical design criteria, and to formulate geotechnical recommendations for lateral earth pressures, foundation walls, drainage considerations, and pavement recommendations. This report summarizes our fieldwork and offers recommendations based on current project plans. This report is considered preliminary since project plans are still under development. We recommend that we be allowed to review the recommendations presented in this report and revise them, as needed, when plans have been finalized.

1.2 Authorization

Authorization to proceed with this study was granted by MainStreet Property Group, LLC. Our work was accomplished in general accordance with our scope of work letter dated July 30, 2018 and later addenda. This report has been prepared for the exclusive use of MainStreet Property Group, LLC and its agents for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering and engineering geology practices in effect in this area at the time our report was prepared. No other warranty, express or implied, is made.

2.0 PROJECT AND SITE DESCRIPTION

The project site consists of three parcels in King County: Parcel Numbers 779240-0230, 779240-0225, and 779240-0190. The parcels are irregularly shaped in plan view, and include a total area of approximately 0.69 acres. Overall vertical relief across the subject property was visually estimated at 5 feet. The site currently includes a grassy area formerly used as a temporary construction staging area on the eastern parcel, a single-story retail building on the central parcel, and a single-story fast food restaurant building on the western parcel. Paved at-grade parking lots and driveways serve the existing buildings.

We were provided with a preliminary architectural plan set prepared by Prep 1, dated July 30, 2019. Current plans call for a new building that occupies essentially the entire site footprint. The building will consist of one level of commercial space at street level, five levels of multifamily residential space above, and one level of parking below. Floor elevation of parking level P1 will be approximately elevation 31 feet. The P1 floor elevation is approximately 9 feet below existing grade.

3.0 SUBSURFACE EXPLORATION

Subsurface exploration for this project included advancing two exploration borings, EB-1 and EB-2, on August 6, 2018. Fifteen direct-push Geoprobe explorations were advanced on February 6, 2019. We also reviewed several exploration boring and monitoring well logs completed by other consultants. The various types of materials and sediments encountered in the explorations, as well as the depths where characteristics of these materials changed, are indicated on the exploration logs included in the Appendix. The depths indicated on the logs where conditions changed may represent gradational variations between sediment types in the field. The locations of our explorations and explorations completed by other consultants on the subject property are shown on Figure 2, “Site and Exploration Plan.”

The number, locations, and depths of the explorations were completed within site and budgetary constraints. It should be noted that subsurface conditions differing from those encountered in our explorations may be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this report and make appropriate changes.

3.1 Exploration Borings

The exploration borings were completed by advancing hollow-stem auger tools with a truck-mounted drill rig. During the drilling process, samples were obtained at generally

5-foot-depth intervals. The exploration borings were continuously observed and logged by a representative from our firm. The exploration logs presented in the Appendix are based on the field logs, drilling action, and inspection of the samples secured.

Disturbed, but representative samples were obtained by using the Standard Penetration Test (SPT) procedure in accordance with *American Society for Testing and Materials* (ASTM) D-1586. This test and sampling method consists of driving a standard 2-inch, outside-diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance ("N") or blow count. If a total of 50 is recorded within one 6-inch interval, the blow count is recorded as the number of blows for the corresponding number of inches of penetration. The resistance, or N-value, provided a measure of the relative density of the granular soils or the relative consistency of cohesive soils; these values are plotted on the attached exploration boring logs.

The samples obtained from the split-barrel sampler were classified in the field and representative portions placed in watertight containers. The samples were then transported to our laboratory for further visual classification and laboratory testing, as summarized in this report.

3.2 Direct-Push Explorations

In February of 2019, Associated Earth Sciences, Inc. (AESI) completed fifteen direct-push explorations. Direct-push explorations were completed using a hydraulic impact hammer to advance a small-diameter probe with a hollow lead section designed to retrieve soil samples. Direct-push explorations allow time and cost-efficient exploration of stratigraphy, and provide samples of soil and groundwater for environmental and geotechnical testing. Groundwater level observations made during direct-push explorations are considered approximate, because explorations are not open long enough to establish equilibrium water levels. Direct-push explorations do not quantitatively measure soil density in a manner similar to SPT sampling.

3.3 Explorations by Others

Three borings and three wells were completed by GeoEngineers, Inc. (GeoEngineers) on the central and west parcels of the current project during the design of the park that now exists offsite to the east. GeoEngineers' explorations B-5, B-11, and B-12 were drilled using the direct-push, air-knife method between June 29, 2009 and June 30, 2009. MW-088 and MW-089 were drilled on July 21, 2017 and MW-343 was drilled on February 1, 2010 using the hollow-stem auger method. Depths of the GeoEngineers' explorations ranged from 20 to 26.5 feet. Groundwater was reportedly encountered 10.5 to 17 feet below ground surface. Logs of the GeoEngineers' explorations discussed here in detail are included in the Appendix of this

report. We generally concur with the soil interpretations in explorations by others that are included with this report.

A ground penetrating radar (GPR) survey was completed by Global Geophysics in 2009 to delineate a peat deposit beneath the adjacent property located to the east of the project. The west edge of that survey suggests that peat deposits extend beneath the subject property. Based on this off-site study by others, AESI completed several direct-push explorations on the east part of the site to delineate peat. Peat delineation is discussed in further detail later in this report.

4.0 SUBSURFACE CONDITIONS

Subsurface conditions at the project site were inferred from field explorations accomplished for this study, review of explorations by others that are discussed in this report and depicted on Figure 2, visual reconnaissance of the site, and review of selected applicable geologic literature. Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that differing subsurface conditions may sometimes be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until construction.

4.1 Stratigraphy

Recent Alluvium

Sediments encountered below the existing asphalt and crushed gravel base course generally consisted of brown-gray sand and gravel with varying amounts of silt. The sediments were observed to be wet at approximately 15 feet below existing ground surface. We interpret these sediments to be recent alluvium (Qal) from the Sammamish River, deposited within or near the main river channel before the river migrated to its present-day course.

Recent alluvium is moderately liquefaction prone and may result in settlement of buildings directly supported on this material during strong seismic shaking. Recommendations for support of new structures are presented in the “Design Recommendations” section of this report. Excavated inorganic alluvium may be used in structural fill applications if it can be properly moisture-conditioned and compacted and is specifically allowed by project specifications.

Peat

Peat was observed within direct-push explorations GP5, GP6, and GP8 at 8 feet below ground surface and in GP11 first at 4 feet and again at 7 feet below ground surface. The peat was observed to be no more than 1 foot in thickness where observed. The peat was generally very moist, dark brown silt with trace sand and abundant fine organics, with some woody debris and rootlets. The approximate location and depth to the bottom and the top of the peat sequence is shown on Figure 2.

At the locations of GeoEngineers' borings B-5 and B-6 peat was reported at depths from approximately 3 to 5 feet below existing grades. "Organic silt" was identified in GeoEngineers' MW-343 between depths of 7 to 10 feet but was not encountered in any of the explorations completed farther to the west or south.

Based on explorations completed by AESI, and on explorations completed onsite by others, it appears that the planned cut to grade to construct project level P1 will result in removal of the observed peat. If peat is identified below excavation level at the time of construction additional investigation and remedial preparation is warranted.

Published Geologic Map

Review of a published geologic map of the site vicinity (*Geologic Map of the Kirkland Quadrangle, Washington*, scale 1:24,000, by J.P., Minard, 1983) indicates that the site is expected to be underlain by young alluvium. Our interpretation of the soils encountered in our explorations is in agreement with the referenced geologic map.

4.2 Hydrology

Groundwater was encountered in each of our explorations at the time of drilling. Observed groundwater conditions are presented on the exploration logs included in the Appendix. Observed groundwater levels estimated at the time of drilling in our subsurface explorations ranged from approximately 24 to 25 feet below the existing ground surface. This equates to groundwater elevations of about 15 to 16 feet above sea level (asl).

Temporary construction dewatering currently underway at a project located near the site approximately at the intersection of Bear Creek Parkway and Redmond Way is known to have depressed typical water levels by approximately 7 to 10 feet in the project area. The observed groundwater levels in our borings completed for this study are therefore not considered representative of long-term water levels that can be expected when the temporary dewatering at the adjacent site is discontinued.

In explorations previously completed by others at this site, groundwater was encountered 10.5 to 17 feet below the ground surface. Those reported water levels predate construction dewatering in the project area, and are considered to be a reliable guide for likely long-term water levels at the site. This is interpreted to be representative of the alluvial aquifer, which is likely hydraulically connected to the Sammamish River to the west of the subject property. For our liquefaction study, we assumed a groundwater table depth of 10 feet beneath the site, simulating the seasonal high groundwater table without water level depression caused by dewatering. The regional groundwater aquifer may be encountered in excavations deeper than about 10 feet, depending on the time of year and whether or not local excavation dewatering is occurring. If excavations for utilities or other facilities will be deeper than about 10 feet, dewatering may be required to control groundwater flow into excavations. Significant dewatering in excess of 500 gallons per minute (gpm) is not anticipated on this project. Groundwater conditions should be expected to vary due to changes in season, precipitation, on- and off-site land usage, local dewatering, and other factors.

4.3 Laboratory Testing

As part of our liquefaction hazards assessment of the site soils, we completed ten laboratory sieve analyses (ASTM D-1140). Results of these analyses are included in the Appendix.

II. GEOLOGIC HAZARDS AND MITIGATIONS

The following discussion of potential geologic hazards is based on the geologic, slope, and ground and surface water conditions, as observed and discussed herein. The discussion will be limited to slope stability, seismic, and erosion issues. The site does not contain slopes that will trigger City of Redmond steep slope critical areas regulations. The site does not appear to contain soils and slope inclinations that would lead to classification as an erosion hazard area under City of Redmond code. The site is mapped as a seismic hazard area as a result of the potential for liquefaction during a seismic event.

5.0 SLOPE HAZARDS AND MITIGATIONS

The site is relatively flat and does not appear to contain slopes that constitute a slope stability hazard, in our opinion, or meet the definition for landslide hazard areas as contained in *Redmond Municipal Code* (RMC) Section 21.64. No quantitative slope stability analysis was completed for this study, and none is warranted, in our opinion.

6.0 SEISMIC HAZARDS AND MITIGATIONS

The following discussion is a general assessment of seismic hazards that is intended to be useful to the owner in terms of understanding seismic issues, and to the structural engineer for structural design.

Earthquakes occur regularly in the Puget Lowland. The majority of these events are small and are not felt by people. However, large earthquakes do occur, as evidenced by the 1949, 7.2-magnitude event; the 2001, 6.8-magnitude event; and the 1965, 6.5-magnitude event. The 1949 earthquake appears to have been the largest in this region during recorded history and was centered in the Olympia area. Evaluation of earthquake return rates indicates that an earthquake of the magnitude between 5.5 and 6.0 is likely within a given 20-year period.

Generally, there are four types of potential geologic hazards associated with large seismic events: 1) surficial ground rupture, 2) seismically induced landslides, 3) liquefaction, and 4) ground motion. The potential for each of these hazards to adversely impact the proposed project is discussed below.

6.1 Surficial Ground Rupture

Generally, the largest earthquakes that have occurred in the Puget Sound area are sub-crustal events with epicenters ranging from 50 to 70 kilometers in depth. Earthquakes that are

generated at such depths usually do not result in fault rupture at the ground surface. However current research indicates that surficial ground rupture is possible in the South Whidbey Island Fault Zone and the Seattle Fault Zone, the closest mapped fault zones to the site. The site is located more than 3 miles from the mapped limits of the South Whidbey Island Fault Zone and the Seattle Fault Zone. Due to the fact that the site lies outside of the currently understood limits of the nearest mapped fault zones, the risk of damage to the project as a result of surficial ground rupture is low, in our opinion.

6.2 Seismically Induced Landslides

The site does not contain substantial slopes, and does not appear to have significant risk of seismically induced landslides, in our opinion. We did not complete a quantitative slope stability analysis as part of this study, and none is warranted, in our opinion.

6.3 Liquefaction

Liquefaction is a process through which unconsolidated soil loses strength as a result of vibrations, such as those which occur during a seismic event. During normal conditions, the weight of the soil is supported by both grain-to-grain contacts and by the fluid pressure within the pore spaces of the soil below the water table. Extreme vibratory shaking can disrupt the grain-to-grain contact, increase the pore pressure, and result in a temporary decrease in soil shear strength. The soil is said to be liquefied when nearly all of the weight of the soil is supported by pore pressure alone. Liquefaction can result in deformation of the sediment and settlement of overlying structures. Areas most susceptible to liquefaction include those areas underlain by non-cohesive silt and sand with low relative densities, accompanied by a shallow water table.

The site is situated in an area mapped as a seismic hazard area according to the City of Redmond critical areas maps. To assess the liquefaction risk, we performed a liquefaction hazard analysis for this site in accordance with guidelines published in Seed & Idriss, 1982; Seed et al., 1985; and Kramer, 1996. Our liquefaction analysis was completed with the aid of LiquefyPro computer software Version 5.8h (2009) by CivilTech Corporation. This program accepts input including SPT data, groundwater level, soil unit weight, stratigraphy, and soil texture and estimates the potential for seismically induced settlement. The liquefaction analysis was conducted based on the subsurface conditions encountered in boring EB-2. The following assumptions were used during the analysis:

- Conservative estimated unit weights are based on locally accepted values for the soil types encountered;

- Silt texture data are based on laboratory testing of soils from EB-2;

- Two different settlement analysis methods were used and obtained a range of estimated liquefaction-induced settlement values;

- The design-level seismic event was assumed to be a magnitude 7.0 earthquake with a peak ground acceleration of 0.541g, in accordance with the 2015 *International Building Code* (IBC);

- Blow counts (N-values) shown on the logs were normalized to reflect the sample collection method (auto hammer), and hole diameter (8 inches).

Based on our liquefaction analysis utilizing soil and groundwater data from EB-2, the subsurface conditions encountered at the site pose a moderate-high risk of liquefaction and associated liquefaction-induced settlement. The estimated seismic-induced settlement for the site ranges from 1.7 to 4.6 inches depending on the analysis method used. Liquefaction risk mitigation is discussed in further detail later in this report.

6.4 Ground Motion

Structural design of the buildings should follow 2015 IBC standards using Site Class "F" as defined in Table 20.3-1 of *American Society of Civil Engineers* (ASCE) *7 - Minimum Design Loads for Buildings and Other Structures*. The IBC has a provision for using Site Class "E" in cases where the proposed building has a fundamental period of less than 0.5 seconds. When a structural engineering design has been completed, we recommend that AESI and the structural engineer work together to determine the appropriate site class. If the project will be designed to Site Class "F", additional geotechnical investigation is required to satisfy IBC requirements.

7.0 EROSION HAZARDS AND MITIGATIONS

Erosion and off-site sediment transport may occur during construction. To mitigate the potential for off-site sediment transport, we recommend the following:

1. Construction activity should be scheduled or phased as much as possible to reduce the amount of earthwork activity that is performed during the winter months.

2. The winter performance of a site is dependent on a well-conceived plan for control of site erosion and stormwater runoff. The project temporary erosion and sediment control (TESC) should include ground-cover measures, access roads, and staging areas. The contractor must implement and maintain the required measures. A site maintenance plan should be in place in the event stormwater turbidity measurements are greater than Washington State Department of Ecology (Ecology) standards.

3. TESC measures for a given area to be graded or otherwise worked should be installed prior to any activity within that area. The recommended sequence of construction within a given area would be to install sediment traps and/or ponds and establish perimeter flow control prior to starting mass grading.

4. During the wetter months of the year, or when large storm events are predicted during the summer months, each work area should be stabilized so that if precipitation occurs, the work area can receive the rainfall without excessive erosion or sediment transport. The required measures for an area to be "buttoned-up" will depend on the time of year and the duration the area will be left un-worked. During the winter months, areas that are to be left un-worked for more than 2 days should be mulched or covered with plastic. During the summer months, stabilization will usually consist of seal-rolling the subgrade. Such measures will aid in the contractor's ability to get back into a work area after a storm event. The stabilization process also includes establishing temporary stormwater conveyance channels through work areas to route runoff to the approved treatment facilities.

5. All disturbed areas should be revegetated as soon as possible. If it is outside of the growing season, the disturbed areas should be covered with mulch, as recommended in the erosion control plan. Straw mulch provides the most cost-effective cover measure and can be made wind-resistant with the application of a tackifier after it is placed.

6. Surface runoff and discharge should be controlled during and following development. Uncontrolled discharge may promote erosion and sediment transport.

7. Soils that are to be reused around the site should be stored in such a manner as to reduce erosion from the stockpile. Protective measures may include, but are not limited to, covering with plastic sheeting, the use of low stockpiles in flat areas, or the use of straw bales/silt fences around pile perimeters. During the period between October 1st and March 31st, these measures are required.

8. On-site erosion control inspections and turbidity monitoring (when required) should be performed in accordance with Ecology requirements. Weekly and monthly reporting to Ecology should be performed on a regularly scheduled basis. Temporary and permanent erosion control and drainage measures should be adjusted and maintained, as necessary, for the duration of project construction.

It is our opinion that with the proper implementation of the TESC plans and by field-adjusting appropriate mitigation elements (best management practices [BMPs]) throughout construction, as recommended by the erosion control inspector, the potential adverse impacts from erosion hazards on the project may be mitigated.

III. DESIGN RECOMMENDATIONS

8.0 INTRODUCTION

The site is underlain by a layer of alluvial sediments that extends to a depth greater than our deepest explorations of 45.5 feet below the existing ground surface. Layers of peat have been observed at depths shallower than the planned excavation and therefore are expected to be removed by the planned excavation. Groundwater levels at the site are currently depressed due to a temporary dewatering operation nearby but offsite. Groundwater levels are expected to rebound to historically normal levels when dewatering is discontinued. Prior to the start of temporary dewatering offsite, groundwater has been observed onsite at depths that range from approximately 1 to 8 feet below the planned elevation of the lowest proposed floor level. It is possible that temporary dewatering could be needed if groundwater is encountered above required excavation depths.

Relatively loose granular soils observed in our exploration borings extend below the ground water level. Liquefaction during a design-level seismic event is estimated to result in 1.7 to 4.6 inches of settlement. The structure could be designed to tolerate the predicted settlement, or the risk of settlement could be mitigated using a deep foundation system such as augercast piles, or a ground improvement system such as aggregate piers.

9.0 SITE PREPARATION

Existing buildings, paving, buried utilities, vegetation, topsoil, and any other deleterious materials should be removed where they are located below planned construction areas. All disturbed soils resulting from demolition activities should be removed to expose underlying undisturbed native sediments and replaced with structural fill, as needed. All excavations below final grade made for demolition activities should be backfilled, as needed, with structural fill. Erosion and surface water control should be established around the clearing limits to satisfy local requirements. Existing on-site wells should be decommissioned by a licensed well driller in accordance with *Washington Administrative Code* (WAC) Section 173-160 if they conflict with the proposed site improvements. If any heating oil storage tanks or other similar structures are present onsite, they should be decommissioned and removed in accordance with applicable Ecology regulations.

9.1 Site Drainage and Surface Water Control

The site should be graded to prevent water from ponding in construction areas and/or flowing into excavations.

Based on existing subsurface data, and current project plans which call for a P1 level floor elevation of approximately 31 feet, we do not anticipate that the planned excavation to pad

elevation will extend below the groundwater table. Perched seepage zones might be encountered, and could be addressed with interceptor trenches and pumped sumps. The deepest temporary excavation is expected to be for the elevator. Preliminary plans call for elevator mechanical spaces to extend to a depth of approximately 24 feet. Excavation to that depth may encounter groundwater and require temporary dewatering. The need for dewatering is uncertain because the timeline for continued operation of off-site dewatering is not known, and because existing subsurface data from on-site wells has included groundwater level observations ranging from 23 to 30 feet prior to the start of off-site dewatering. If temporary dewatering is needed to allow construction of the elevator pit, it is likely that the water level will need to be depressed by a few feet over a small area. That degree of dewatering could likely be accomplished with approximately four temporary dewatering wells spaced around the perimeter of the elevator pit. The need for and design of dewatering should be based on field conditions that are present at the time of construction. Elevator design must comply with RMC 15.24.095 (4).

Subfloor drains should be included in project plans. Subfloor drains should consist of perforated drain pipes bedded in pea gravel and graded to drain to a suitable discharge location by gravity. Perforated pipes should be approximately 15 feet on-center. Pea gravel used to bed subfloor drains should freely communicate with capillary break materials below the floor slabs.

Final exterior grades should promote free and positive drainage away from the buildings at all times. Water must not be allowed to pond, or to collect adjacent to foundations or within the immediate building areas. We recommend that a gradient of at least 3 percent for a minimum distance of 10 feet from the building perimeters be provided, except in paved locations. In paved locations, a minimum gradient of 1 percent should be provided, unless provisions are included for collection and disposal of surface water adjacent to the structures.

9.2 Subgrade Protection

The alluvial soils contain between 2 and 8 percent fine-grained material and are considered moderately sensitive to excess moisture during construction. The contractor must use care during site preparation and excavation operations so that the underlying soils are not softened. If disturbance occurs, the softened soils should be removed and the area brought to grade with structural fill. If crushed rock is considered for the access and staging areas, it should be underlain by stabilization fabric (such as Mirafi 500X or approved equivalent) to reduce the potential of fine-grained materials pumping up through the rock and turning the area to mud. The fabric will also aid in supporting construction equipment, thus reducing the amount of crushed rock required. We recommend that at least 10 inches of rock be placed over the fabric; however, due to the variable nature of the near-surface soils and differences in wheel loads, this thickness may have to be adjusted by the contractor in the field.

9.3 Proof-Rolling and Subgrade Compaction

Following the recommended demolition, site stripping, and planned excavation, the stripped subgrade within the building areas should be proof-rolled with heavy, rubber-tired construction equipment, such as a fully loaded, tandem-axle dump truck. Proof-rolling should be performed prior to structural fill placement or foundation excavation. The proof-roll should be monitored by the geotechnical engineer so that any soft or yielding subgrade soils can be identified. Any soft/loose, yielding soils should be removed to a stable subgrade. The subgrade should then be scarified, adjusted in moisture content, and recompacted to the required density. Proof-rolling should only be attempted if soil moisture contents are at or near optimum moisture content. Proof-rolling of wet subgrades could result in further degradation. Low areas and excavations may then be raised to the planned finished grade with compacted structural fill. Subgrade preparation and selection, placement, and compaction of structural fill should be performed under engineering-controlled conditions in accordance with the project specifications.

9.4 Overexcavation/Stabilization

Construction during extended wet weather periods could create the need to overexcavate exposed soils if they become disturbed and cannot be recompacted due to elevated moisture content and/or weather conditions. Even during dry weather periods, soft/wet soils, which may need to be overexcavated, may be encountered in some portions of the site. If overexcavation is necessary, it should be confirmed through continuous observation and testing by AESI. Soils that have become unstable may require remedial measures in the form of one or more of the following:

1. Drying and recompaction. Selective drying may be accomplished by scarifying or windrowing surficial material during extended periods of dry and warm weather.

2. Removal of affected soils to expose a suitable bearing subgrade and replacement with compacted structural fill.

3. Mechanical stabilization with a coarse crushed aggregate compacted into the subgrade, possibly in conjunction with a geotextile.

9.5 Temporary and Permanent Cut Slopes

In our opinion, stable construction slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, however, we anticipate that temporary, unsupported cut slopes in unsaturated existing fill and unsaturated alluvial sediments can be made at a maximum slope of 1.5H:1V (Horizontal:Vertical) or flatter. As is typical with earthwork operations, some sloughing and raveling may occur, and cut slopes may have to be adjusted in the field. If groundwater seepage is encountered in cut slopes, or if surface water is not routed away from temporary cut slope faces, flatter slopes will be required. In addition, WISHA/OSHA regulations should be followed at all times. Permanent cut and

structural fill slopes that are not intended to be exposed to surface water should be designed at inclinations of 2H:1V or flatter. All permanent cut or fill slopes should be compacted to at least 95 percent of the modified Proctor maximum dry density, as determined by ASTM D-1557, and the slopes should be protected from erosion by sheet plastic until vegetation cover can be established during favorable weather.

9.6 Excavation Shoring

We anticipate that excavation shoring will be required. Shoring may be combined with the planned basement wall, or a stand-alone temporary shoring system might be used to allow construction of the basement wall that will provide permanent support. Shoring might consist of a cantilevered soldier pile or soil nail shoring system, depending in part on whether soil nails are permitted to extend offsite. AESI is available to provide geotechnical engineering parameters for shoring system design when a shoring system and basement wall plan have been selected. It should be noted that pressure-treated lagging used in shoring systems is not allowed by the RMC.

9.7 Frozen Subgrades

If earthwork takes place during freezing conditions, all exposed subgrades should be allowed to thaw and then be recompacted prior to placing subsequent lifts of structural fill or foundation components. Alternatively, the frozen material could be stripped from the subgrade to reveal unfrozen soil prior to placing subsequent lifts of fill or foundation components. The frozen soil should not be reused as structural fill until allowed to thaw and adjusted to the proper moisture content, which may not be possible during winter months.

10.0 STRUCTURAL FILL

All references to structural fill in this report refer to subgrade preparation, fill type and placement, and compaction of materials, as discussed in this section. If a percentage of compaction is specified under another section of this report, the value given in that section should be used.

After stripping, planned excavation, and any required overexcavation have been performed to the satisfaction of the geotechnical engineer, the upper 12 inches of exposed ground in areas to receive fill should be recompacted to 95 percent of the modified Proctor maximum density using ASTM D-1557 as the standard. If the subgrade contains silty soils and too much moisture, adequate recompaction may be difficult or impossible to obtain, and should probably not be attempted. In lieu of recompaction, the area to receive fill should be blanketed with washed rock or quarry spalls to act as a capillary break between the new fill and the wet subgrade. Where the exposed ground remains soft and further overexcavation is impractical, placement of an engineering stabilization fabric may be necessary to prevent contamination of the free-draining layer by silt migration from below.

After recompaction of the exposed ground is tested and approved, or a free-draining rock course is laid, structural fill may be placed to attain desired grades. Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer, placed in maximum 8-inch loose lifts, with each lift being compacted to 95 percent of the modified Proctor maximum density using ASTM D-1557 as the standard. In the case of roadway and utility trench filling, the backfill should be placed and compacted in accordance with current City of Redmond codes and standards. The top of the compacted fill should extend horizontally outward a minimum distance of 3 feet beyond the locations of the roadway edges before sloping down at an angle of 2H:1V.

The contractor should note that any proposed fill soils must be evaluated by AESI prior to their use in fills. This would require that we have a sample of the material 72 hours in advance to perform a Proctor test and determine its field compaction standard. Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. Use of moisture-sensitive soil in structural fills should be limited to favorable dry weather conditions. The native soils present onsite contained a low to moderate amount of silt and are considered moderately moisture-sensitive. On-site soils may be reused in structural fill applications if moisture conditions can be achieved that allow compaction to a firm and unyielding condition and to the specified minimum density for the application where they are used. If fill is placed during wet weather or if proper compaction cannot be obtained, a select import material consisting of a clean, free-draining gravel and/or sand should be used. Free-draining fill consists of non-organic soil with the amount of fine-grained material limited to 5 percent by weight when measured on the minus No. 4 sieve fraction with at least 25 percent retained on the No. 4 sieve. All imported fill materials must comply with RMC 15.24.095 (2).

A representative from our firm should inspect the stripped subgrade and be present during placement of structural fill to observe the work and perform a representative number of in-place density tests. In this way, the adequacy of the earthwork may be evaluated as filling progresses, and any problem areas may be corrected at that time. It is important to understand that taking random compaction tests on a part-time basis will not assure uniformity or acceptable performance of a fill. As such, we are available to aid the owner in developing a suitable monitoring and testing program.

11.0 FOUNDATIONS

Three possible foundation support alternatives include:

Shallow Foundations: Conventional shallow foundations could be used if the structural engineering design is able to tolerate up to 4.6 inches of settlement during a seismic event. An allowable foundation soil bearing pressure of 3,500 pounds per square foot (psf) should be used for planning purposes.

Ground Improvement: Stone columns could be used for ground improvement, followed by construction of the new building using conventional shallow foundations designed with an allowable foundation soil bearing pressure of 5,000 to 6,000 psf.

Augercast Piles: The building could be supported by augercast piles. Augercast piles are commonly designed with axial compressive capacity of 25 to 50 tons per pile.

Concrete masonry work will require a plan for masonry cleaning wastewater management in the Stormwater Pollution and Prevention Plan (SWPPP) that meets *Redmond Zoning Code* (RZC) 21.64.050: Protection Standards During Construction.

11.1 Stone Columns

Stone columns consist of columns of compacted crushed rock below the building pad. Installation of stone columns results in significant densification of the surrounding soils, as well as a network of compacted stone columns that transmit loads directly to more competent soils at depths. There is little consistency between different contractors who install stone columns with respect to their installation equipment and methods. The diameters, depth capability, compactive energy, and other critical factors of each contractor's equipment must be considered when designing a stone column foundation system, and therefore such systems are typically designed by the contractor who installs them. Once stone columns are installed, the building is constructed with a conventional shallow foundation system above a subgrade that has been improved through installation of stone columns. Air or water jetting is not permitted as a means to advance stone column installation tools or to clear cuttings.

The stone columns should be installed after the site is excavated and the building pad fill is placed and compacted. The purpose of stone columns is to both improve existing loose soils and to transmit loads directly to more competent bearing materials at depth. Stone columns are formed by advancing a hollow mandrel to a pre-determined depth. Crushed rock is then installed through the hollow mandrel in thin lifts and compacted by vibration and downward pressure. The result is a column of compacted aggregate and compaction of soils surrounding the stone columns. Stone columns are proprietary systems and are designed by the contractor who installs them. The contractor will determine the depth and diameter of the stone column holes and the appropriate spacing.

Coarse gravel was observed in our exploration borings; pre-drilling at aggregate pier locations may be needed to achieve desired production rates. We recommend that if pre-drilling aggregate pier locations is needed that it be included in project scheduling and cost estimating. Other obstacles such as roots, stumps, and rocks are possible. Where drilling obstacles are encountered, the contractor should be prepared to relocate stone columns, or remove obstacles, as needed. The contractor should expect groundwater below depths of 10 feet based on explorations included with this report. In our opinion, using a system of stone columns, it

would be possible to achieve an allowable foundation soil bearing pressure of 5,000 to 6,000 psf.

11.2 Baseline Survey

Installation of stone columns will cause vibration that could trigger complaints from adjacent properties. We recommend completion of a detailed photographic survey of adjacent buildings, sidewalks, utilities, and paving prior to constructing stone columns. Particular attention should be paid to documenting any existing cracks in masonry walls, sidewalks, and other structures prior to stone column construction. The owner and construction team should consider placing crack gauges or other monitoring devices on significant pre-existing cracks. If the owner or construction team feels that vibration-related complaints are likely, additional measures, such as survey monitoring and vibration monitoring, should be considered.

We recommend that project specifications be tailored to include vibration-related issues so that unanticipated schedule and cost impacts do not occur as a result of vibration monitoring.

11.3 Augercast Piles

Cast-in-place concrete piles (Augercast) could also be used for foundation support. A representative from AESI should be onsite to monitor the installation of the piles. We recommend that pile placement should be accomplished by a contractor experienced in their installation. Based upon the boring logs, we estimate pile lengths to be on the order of 30 to 45 feet.

If augercast piles are selected, we should be allowed to provide situation-specific recommendations. Augercast pile allowable axial compression capacities of 25 to 50 tons per pile are typical and are feasible at this site.

11.4 Drainage Considerations

Section 9.1 of this report provides recommendations for subfloor drains. Foundations should be provided with foundation drains. Drains should consist of rigid, perforated, polyvinyl chloride (PVC) pipe surrounded by washed pea gravel. The drains should be constructed with sufficient gradient to allow gravity discharge away from the proposed buildings. Roof and surface runoff should not discharge into the footing drain system, but should be handled by a separate, rigid, tightline drain. In planning, exterior grades adjacent to walls should be sloped downward away from the proposed structures to achieve surface drainage. Depending on the locations and final grades that are selected for the buildings, subfloor drains may be appropriate. As a general guide, building locations that are 5 feet or less above observed groundwater would warrant subfloor drains.

12.0 FOUNDATION WALLS

All backfill behind foundation walls or around foundation units should be placed as per our recommendations for structural fill and as described in this section of the report. Horizontally backfilled walls, which are free to yield laterally at least 0.1 percent of their height, may be designed to resist an active lateral earth pressure represented by an equivalent fluid equal to 35 pounds per cubic foot (pcf). Fully restrained, horizontally backfilled, rigid walls that cannot yield should be designed for an equivalent fluid of 50 pcf. Walls with sloping backfill up to a maximum gradient of 2H:1V should be designed using an equivalent fluid of 55 pcf for yielding conditions or 75 pcf for fully restrained conditions. A surcharge equivalent to 2 feet of soil should be added to the wall height in determining lateral design forces to accommodate adjacent paving.

As required by the 2015 IBC, retaining wall design should include a seismic surcharge pressure in addition to the equivalent fluid pressures presented above. Considering the site soils and the recommended wall backfill materials, we recommend a seismic surcharge pressure of 5H and 10H psf, where H is the wall height in feet for the “active” and “at-rest” loading conditions, respectively. The seismic surcharge should be modeled as a rectangular distribution with the resultant applied at the midpoint of the walls.

The lateral pressures presented above are based on the conditions of a uniform backfill consisting of excavated on-site soils, or imported structural fill compacted to 90 percent of ASTM D-1557. A higher degree of compaction is not recommended, as this will increase the pressure acting on the walls. A lower compaction may result in settlement of the slab-on-grade or other structures supported above the walls. Thus, the compaction level is critical and must be tested by our firm during placement. Surcharges from adjacent footings or heavy construction equipment must be added to the above values. Perimeter footing drains should be provided for all retaining walls, as discussed under the “Drainage Considerations” section of this report.

It is imperative that proper drainage be provided so that hydrostatic pressures do not develop against the walls. This would involve installation of a minimum 1-foot-wide blanket drain to within 1 foot of finish grade for the full wall height using imported, washed gravel against the walls.

12.1 Passive Resistance and Friction Factors

Lateral loads can be resisted by friction between the foundation and the natural soils or supporting structural fill soils, and by passive earth pressure acting on the buried portions of the foundations. The foundations must be backfilled with structural fill and compacted to at least 95 percent of the maximum dry density to achieve the passive resistance provided below. We recommend the following allowable design parameters:

- Passive equivalent fluid = 250 pcf
- Coefficient of friction = 0.30

13.0 FLOOR SUPPORT

If stone columns are used, footings can be constructed using standard shallow foundation design and construction methods. If conventional shallow foundations or drilled piles are used, the floor slab should either be supported on augercast piles, or isolated from the foundation elements and supported on a minimum thickness of 2 feet of granular structural fill compacted to 95 percent of ASTM-D 1557 to provide uniform support of the slab. Unless the floor is underlain by aggregate piers or pile-supported, it would be susceptible to settlement up to 4.6 inches during a design-level seismic event.

Regardless of type, floor slabs should be cast atop a minimum of 4 inches of clean, washed, crushed rock or pea gravel to act as a capillary break. Areas of subgrade that are disturbed (loosened) during construction should be compacted to a non-yielding condition prior to placement of capillary break material. Floor slabs should also be protected from dampness by an impervious moisture barrier at least 10 mils thick. The moisture barrier should be placed between the capillary break material and the concrete slab.

14.0 PAVEMENT RECOMMENDATIONS

Pavement areas should be prepared in accordance with the "Site Preparation" section of this report. If the stripped native soil or existing fill pavement subgrade can be compacted to 95 percent of ASTM D-1557 and is firm and unyielding, no additional overexcavation is required. Soft or yielding areas should be overexcavated to provide a suitable subgrade and backfilled with structural fill.

The pavement sections included in this report section are for driveway and parking areas onsite, and are not applicable to right-of-way improvements. At this time, this report does not address right-of-way improvements; however, if any new paving of public streets is required, we should be allowed to offer situation-specific recommendations.

The exposed ground should be recompacted to 95 percent of ASTM D-1557. If required, structural fill may then be placed to achieve desired subbase grades. Upon completion of the recompaction and structural fill, a pavement section consisting of 2½ inches of asphaltic concrete pavement (ACP) underlain by 4 inches of 1¼-inch crushed surfacing base course is the recommended minimum in areas of planned passenger car driving and parking. In heavy traffic areas, a minimum pavement section consisting of 3 inches of ACP underlain by 2 inches of $^{5}/_{8}$-inch crushed surfacing top course and 4 inches of 1¼-inch crushed surfacing base course is recommended. The crushed rock courses must be compacted to 95 percent of the maximum density, as determined by ASTM D-1557. All paving materials should meet gradation criteria

contained in the current Washington State Department of Transportation (WSDOT) Standard Specifications.

Depending on construction staging and desired performance, the crushed base course material may be substituted with asphalt treated base (ATB) beneath the final asphalt surfacing. The substitution of ATB should be as follows: 4 inches of crushed rock can be substituted with 3 inches of ATB, and 6 inches of crushed rock may be substituted with 4 inches of ATB. ATB should be placed over a native or structural fill subgrade compacted to a minimum of 95 percent relative density, and a 1½- to 2-inch thickness of crushed rock to act as a working surface. If ATB is used for construction access and staging areas, some rutting and disturbance of the ATB surface should be expected. The general contractor should remove affected areas and replace them with properly compacted ATB prior to final surfacing.

15.0 STORMWATER INFILTRATION FEASIBILITY

Our assessment of infiltration feasibility includes general surface characterization, subsurface exploration, grain-size testing, and groundwater analyses. It is our understanding that the project is under the City of Redmond 2017 *Clearing, Grading, and Stormwater Management Technical Notebook* (SWMTN), and the 2014 Ecology *Stormwater Management Manual for Western Washington* (Ecology Manual), which will provide the guidance for the site suitability criteria for infiltration.

Recent alluvium consisting of sands and gravels were encountered near ground surface in all explorations performed for this study. Recent alluvium may be suitable for use as an infiltration receptor where it is not saturated, however available groundwater data indicates that the unsaturated thickness of alluvial sediments below the building will be insufficient to accommodate stormwater infiltration.

16.0 FUTURE WORK

The following additional tasks are recommended:

Seismic Site Class: Final selection of seismic site class should be made when a structural engineering design has been completed. If Site Class "F" is selected, a site-specific ground motion analysis will be needed to satisfy code requirements.

17.0 PROJECT DESIGN AND CONSTRUCTION MONITORING

Our recommendations are preliminary in that design and construction details have not been finalized at the time of this report. We are available to provide additional geotechnical consultation as the project design develops and possibly changes from that upon which this

report is based. We recommend that AESI perform a geotechnical review of the plans prior to final design completion. In this way, our earthwork and foundation recommendations may be properly interpreted and implemented in the design.

We are also available to provide geotechnical engineering and monitoring services during construction. The integrity of the foundations depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of this current scope of work. If these services are desired, please let us know and we will prepare a proposal.

We have enjoyed working with you on this study and are confident that these recommendations will aid in the successful completion of your project. If you should have any questions, or require further assistance, please do not hesitate to call.

18.0 CLOSING

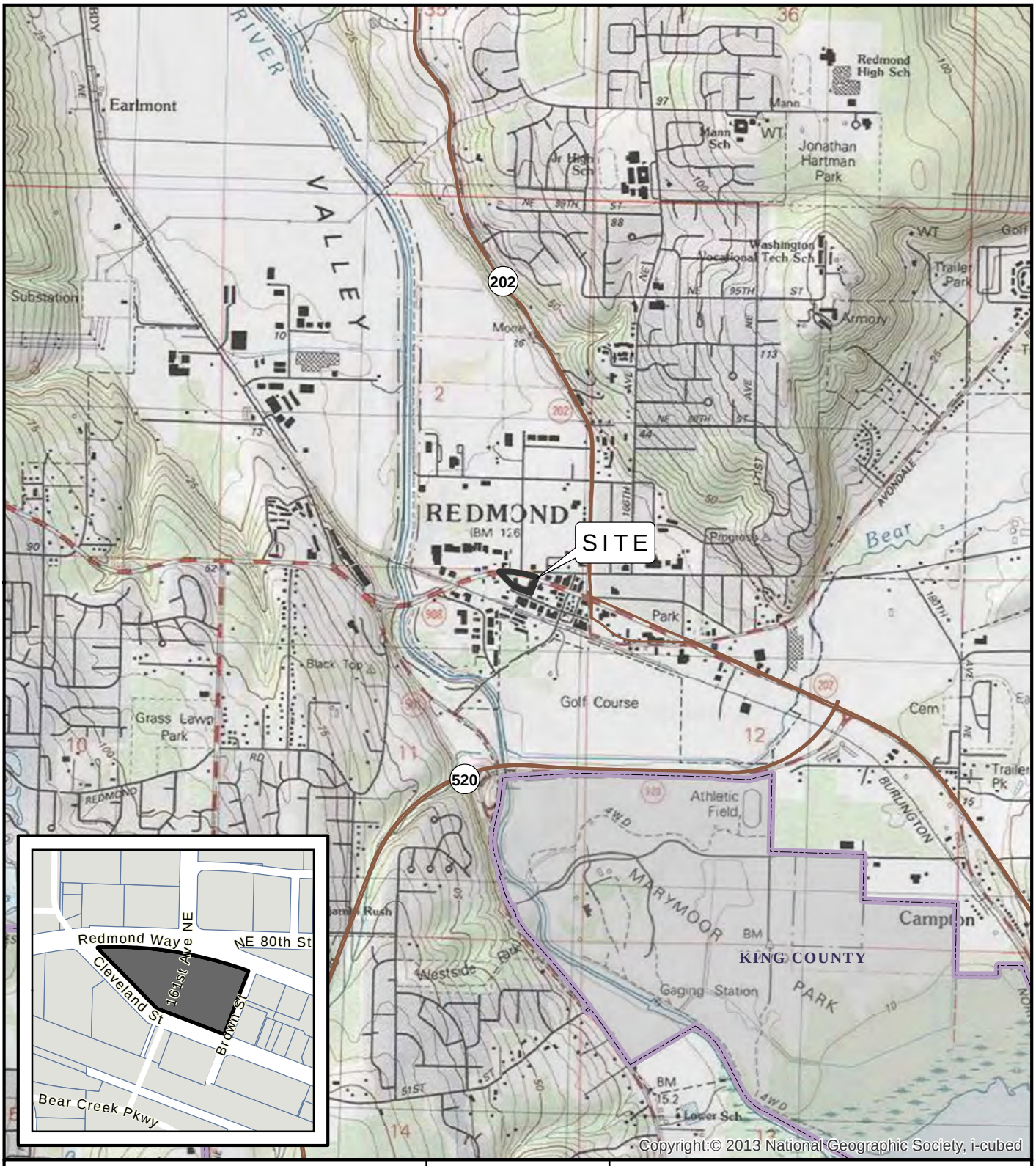
We have enjoyed working with you on this study and are confident that these recommendations will aid in the successful completion of your project. If you should have any questions or require further assistance, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

Bruce W. Guenzler, L.E.G.
Associate Geologist

Kurt D. Merriman, P.E.
Senior Principal Engineer

Attachments:
Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Appendix: Exploration Logs
Laboratory Testing Results
Explorations by Others



DATA SOURCES / REFERENCES:
USGS: 7.5' SERIES TOPOGRAPHIC MAPS, ESRI/I-CUBED/NGS 2013
KING CO: STREETS, PARCELS, CITY LIMITS 1/18

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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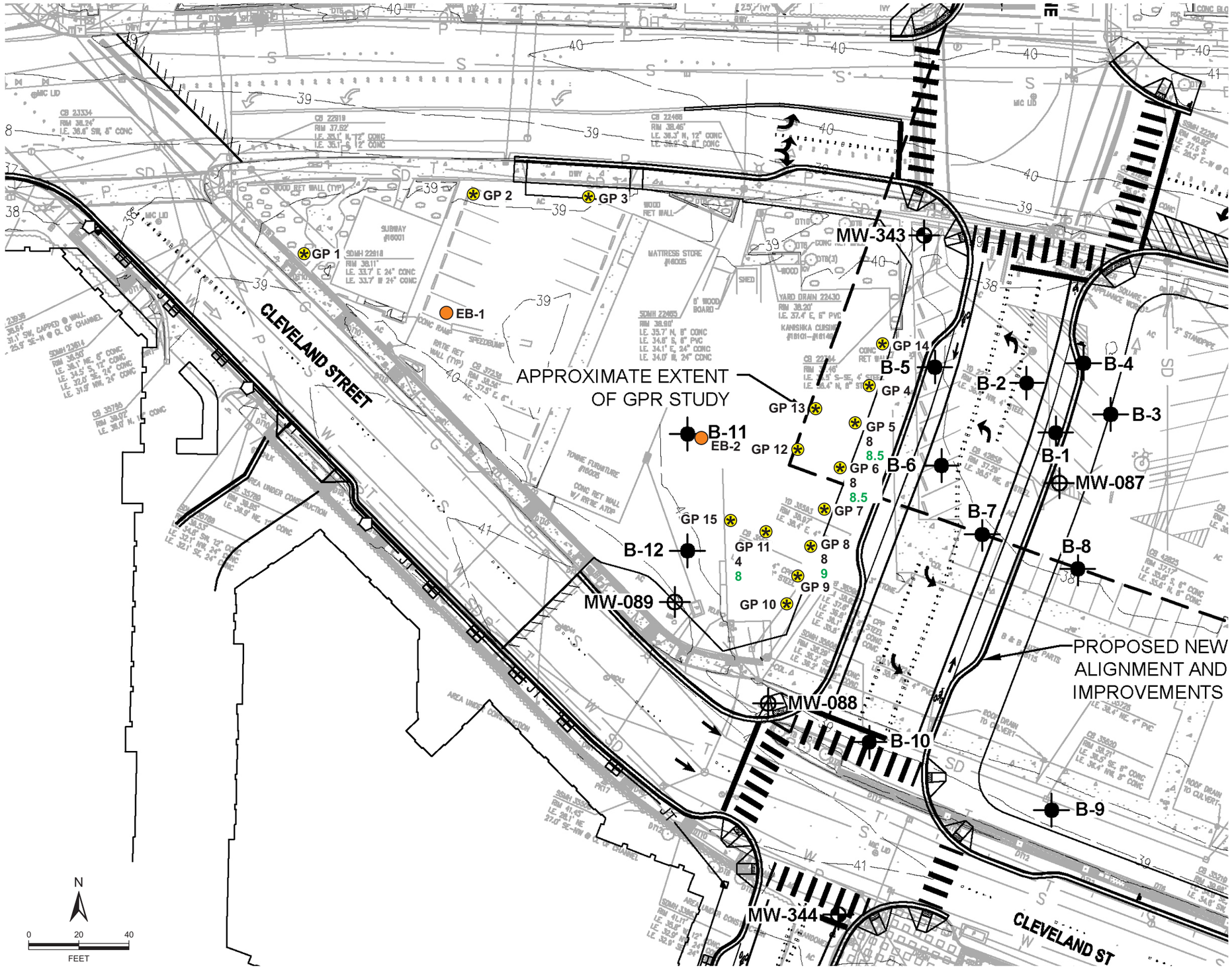
VICINITY MAP

REDMOND CENTRAL
REDMOND, WASHINGTON

PROJ NO.	DATE:	FIGURE:
180378V003	2/19	1

Document Path: G:\GIS_Projects\aaY2018\VM\180378V003 F1 VM_RedmondCentral.mxd



LEGEND:

- **EB** — EXPLORATION BORING - AESI 2018
- **GP** — GEOPROBE BORING - AESI 2019
  - 8 — WITH DEPTH (FT) TO TOP OF PEAT,
  - 9 — WITH DEPTH (FT) TO BOTTOM OF PEAT
- **MW** — MONITORING WELL - GEOENGINEERS 2010
- **B** — BORING - GEOENGINEERS 2009
- **MW** — MONITORING WELL - GEOENGINEERS 2007

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

NOTES:
1. BASE MAP REFERENCE: GEOENGINEERS, 161 ST AVENUESE EXTENSION, SITE PLAN, FIGURE 2, UNDATED.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

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SITE AND EXPLORATION PLAN

REDMOND CENTRAL
REDMOND, WASHINGTON

PROJ NO.	DATE:	FIGURE:
180378E002	2/19	2

180378 Redmond Central \ 180378E002 F2 S-E Plan.cdr

APPENDIX

Exploration Logs

Laboratory Testing Results

Exploration by Others

Coarse-Grained Soils - More than 50% [1] Retained on No. 200 Sieve	Gravels - More than 50% [1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines [5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines [5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50% [1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines [5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines [5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50% [1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

	Density	SPT [2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50
	Consistency	**SPT [2] blows/foot**
Fine-Grained Soils	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

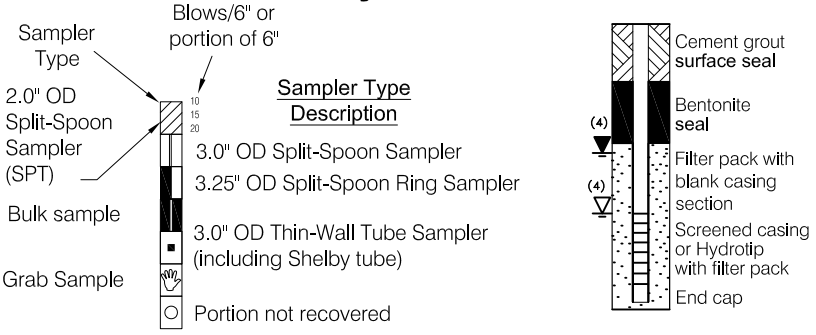
[3] Estimated Percentage

Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols



(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
▼ ATD = At time of drilling
▽ Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 12%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

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Exploration Log

Project Number	Exploration Number	Sheet
180378E001	EB-1	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	40
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Gregory Drilling / Truck Mounted Rig	Date Start/Finish	8/6/18,8/6/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	7.5 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - ~2.5 inches					
				Recent Alluvium					
				Moderate gravel, difficult drilling, difficult keeping auger straight 0.5 to 2.5 feet.					
		S-1		Moist, brown to grayish light brown, medium SAND, trace silt, trace gravel; rootlets in sampler head (SP).			2 3 3	▲6	
5		S-2		Moist, light brown to grayish light brown, fine to medium SAND, trace silt, trace gravel; minor organics (rootlets); coarsening upwards (SP).			3 4 5	▲9	
				Moderate gravel in cuttings at 9 feet.					
10		S-3		Slightly moist to very moist, light grayish brown, fine SAND, trace silt, trace gravel; gravel coarsening upwards (SP).			6 8 5	▲13	
15		S-4		Moist to wet with sampler tip very moist, light grayish brown with oxidation, fine to medium SAND, trace to some gravel, trace silt, ranging to gravelly; large gravel blocking sampler tip; moderate gravel in cuttings (SP-GP). Difficult drilling (gravel) at 16 feet.			11 10 7	▲17	
20		S-5		Moist, slightly oxidized grayish brown, fine to mostly medium SAND, trace silt, trace gravel; poor recovery and high blowcounts due to rock in sampler head (SP).			18 17 22	▲39	
25		S-6		Wet, brown, fine to medium SAND, trace silt, trace to some gravel; gravel blocking sampler head; increasing fines (SP). Driller observes water at top of sampler at 25 feet.		▼	17 22 23	▲45	
30		S-7		Wet, brown, fine to medium SAND, trace silt, some gravel ranging to gravelly, fine to medium SAND; water present at top of sampler; coarsening downwards (SP-GP). Driller notes 3 feet of heave at 30 feet.			23 17 19	▲36	
35		S-8		Wet, brown, fine to coarse SAND, trace silt, trace gravel; occasional mica; coarsening downwards; gravel stuck in sampler (SP). Driller notes gravel at 35 feet.			12 20 18	▲38	
40		S-9		Wet, brown to brownish gray, fine to coarse SAND, some gravel, trace silt ranging to gravelly, fine to coarse SAND; occasional mica (SP-GP). Injected water to remove stuck sampler at 40 feet.			40 50/3.5"	▲50/3.5"	
				Bottom of exploration boring at 41.5 feet. Groundwater encountered at 25 feet.					
45									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: JHS

AESIBOR 180378.GPJ February 25, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E001	EB-2	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	40
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Gregory Drilling / Truck Mounted Rig	Date Start/Finish	8/6/18,8/6/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	7.5 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - ~2.5 inches					
				Recent Alluvium					
				Difficult drilling, abundant gravel 0.5 to 3 feet.					
		S-1		Slightly moist to moist, oxidized orangish brown, very gravelly, SAND, some silt (SP-GP).			8 7 5	▲12	
5		S-2		As above, gravelly.			4 6 4	▲10	
10		S-3		Moist, slightly oxidized grayish brown, very gravelly, SAND, some silt; poor recovery (SW-GW). Difficult drilling at 10 feet.			7 6 6	▲12	
15		S-4		Moist, slightly oxidized grayish brown, fine to mostly medium SAND, some silt, trace gravel; rusted metal flakes at top of spoon, likely not part of sample at 14 feet, possible sluff (SP).			2 5 7	▲12	
20		S-5		Moist, heavily oxidized at bottom of spoon orangish brown, sandy, GRAVEL, trace silt; rock in head of sampler (SP-GP).			7 9 14	▲23	
				Driller notes increased gravel at 22 feet.					
25		S-6		Wet, orangish brown, very gravelly, SAND, trace silt; coarsening downward; occasional mica; poor recovery (SP-GP).		▼	1 9 15	▲24	
30		S-7		Wet, slightly oxidized brown, gravelly, SAND, trace silt; occasional mica flakes; poor recovery (SP-GP). Heaving sands at 29 feet.			8 16 19	▲35	
35		S-8		Wet, grayish brown, very sandy, GRAVEL, trace silt; rock lodged in sampler head; lens (2 inches thick) of gravel, trace fine sand (GP).			11 13 14	▲27	
				Driller notes increased difficulty (gravel) at 38 feet.					
40		S-9		Wet, grayish brown, gravelly, SAND, trace silt ; gravel lodged in sampler head (SP-GP). Water added to auger at 40 feet.			6 11 21	▲32	
45		S-10		Wet, grayish brown, very gravelly, SAND, some silt; clean sampler head (SP-GP).			5 13 23	▲36	
				Bottom of exploration boring at 45.5 feet. Groundwater encountered at 24 feet.					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: JHS

AESIBOR 180378.GPJ February 25, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E001	EB-1	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	40
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Gregory Drilling / Truck Mounted Rig	Date Start/Finish	8/6/18,8/6/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	7.5 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - ~2.5 inches					
				Recent Alluvium					
				Moderate gravel, difficult drilling, difficult keeping auger straight 0.5 to 2.5 feet.					
		S-1		Moist, brown to grayish light brown, medium SAND, trace silt, trace gravel; rootlets in sampler head (SP).			2 3 3	▲6	
5		S-2		Moist, light brown to grayish light brown, fine to medium SAND, trace silt, trace gravel; minor organics (rootlets); coarsening upwards (SP).			3 4 5	▲9	
				Moderate gravel in cuttings at 9 feet.					
10		S-3		Slightly moist to very moist, light grayish brown, fine SAND, trace silt, trace gravel; gravel coarsening upwards (SP).			6 8 5	▲13	
15		S-4		Moist to wet with sampler tip very moist, light grayish brown with oxidation, fine to medium SAND, trace to some gravel, trace silt, ranging to gravelly; large gravel blocking sampler tip; moderate gravel in cuttings (SP-GP). Difficult drilling (gravel) at 16 feet.			11 10 7	▲17	
20		S-5		Moist, slightly oxidized grayish brown, fine to mostly medium SAND, trace silt, trace gravel; poor recovery and high blowcounts due to rock in sampler head (SP).			18 17 22	▲39	
25		S-6		Wet, brown, fine to medium SAND, trace silt, trace to some gravel; gravel blocking sampler head; increasing fines (SP). Driller observes water at top of sampler at 25 feet.		▼	17 22 23	▲45	
30		S-7		Wet, brown, fine to medium SAND, trace silt, some gravel ranging to gravelly, fine to medium SAND; water present at top of sampler; coarsening downwards (SP-GP). Driller notes 3 feet of heave at 30 feet.			23 17 19	▲36	
35		S-8		Wet, brown, fine to coarse SAND, trace silt, trace gravel; occasional mica; coarsening downwards; gravel stuck in sampler (SP). Driller notes gravel at 35 feet.			12 20 18	▲38	
40		S-9		Wet, brown to brownish gray, fine to coarse SAND, some gravel, trace silt ranging to gravelly, fine to coarse SAND; occasional mica (SP-GP). Injected water to remove stuck sampler at 40 feet.			40 50/3.5"	▲50/3.5"	
				Bottom of exploration boring at 41.5 feet. Groundwater encountered at 25 feet.					
45									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: JHS

AESIBOR 180378.GPJ February 25, 2019

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180378E001	EB-2	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	40
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Gregory Drilling / Truck Mounted Rig	Date Start/Finish	8/6/18,8/6/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	7.5 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - ~2.5 inches					
				Recent Alluvium					
				Difficult drilling, abundant gravel 0.5 to 3 feet.					
		S-1		Slightly moist to moist, oxidized orangish brown, very gravelly, SAND, some silt (SP-GP).			8 7 5	▲12	
5		S-2		As above, gravelly.			4 6 4	▲10	
10		S-3		Moist, slightly oxidized grayish brown, very gravelly, SAND, some silt; poor recovery (SW-GW). Difficult drilling at 10 feet.			7 6 6	▲12	
15		S-4		Moist, slightly oxidized grayish brown, fine to mostly medium SAND, some silt, trace gravel; rusted metal flakes at top of spoon, likely not part of sample at 14 feet, possible sluff (SP).			2 5 7	▲12	
20		S-5		Moist, heavily oxidized at bottom of spoon orangish brown, sandy, GRAVEL, trace silt; rock in head of sampler (SP-GP).			7 9 14	▲23	
				Driller notes increased gravel at 22 feet.					
25		S-6		Wet, orangish brown, very gravelly, SAND, trace silt; coarsening downward; occasional mica; poor recovery (SP-GP).		▼	1 9 15	▲24	
30		S-7		Wet, slightly oxidized brown, gravelly, SAND, trace silt; occasional mica flakes; poor recovery (SP-GP). Heaving sands at 29 feet.			8 16 19	▲35	
35		S-8		Wet, grayish brown, very sandy, GRAVEL, trace silt; rock lodged in sampler head; lens (2 inches thick) of gravel, trace fine sand (GP).			11 13 14	▲27	
				Driller notes increased difficulty (gravel) at 38 feet.					
40		S-9		Wet, grayish brown, gravelly, SAND, trace silt ; gravel lodged in sampler head (SP-GP). Water added to auger at 40 feet.			6 11 21	▲32	
45		S-10		Wet, grayish brown, very gravelly, SAND, some silt; clean sampler head (SP-GP).			5 13 23	▲36	
				Bottom of exploration boring at 45.5 feet. Groundwater encountered at 24 feet.					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: JHS

AESIBOR 180378.GPJ February 25, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378V003	GP3	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	39
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/5/19,2/5/19
Hammer Weight/Drop	N/A	Hole Diameter (in)	2 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - 2 inches					
				Fill					
		S-1		Slightly moist, brown, silty, gravelly, fine to medium SAND; occasional organics (SM).					
				Recent Alluvium					
				Slightly moist, brown, medium SAND, trace gravel (SP).					
5				GP3-5 (0.0 ppm)					
		S-2		Becomes gravelly.					
				Driller notes gravel plugged up sampler at ~8 feet. GP3-8 (0.0 ppm)					
10				Slightly moist, brown, medium SAND, trace fine sand (SP).					
		S-3		Becomes gravelly.					
				Slightly moist, brown, medium SAND, trace coarse sand (SP).					
15				GP3-15 (0.0 ppm)					
		S-4		Slightly moist, brown, very sandy, GRAVEL (GP).					
20				Wet, brown, medium SAND, trace to some gravel (SP). GP3-20 (0.0 ppm); GP3-GW		▼			X X
		S-5		Driller notes pushing gravel at ~22 feet. GP3-22 (0.0 ppm)					
25				Bottom of exploration boring at 25 feet. Groundwater encountered at 20 feet. Temporary well screen placed from 20 to 25 feet. Boring backfilled with bentonite. (###ppm) = Photoionization detector measurement in parts per million. X = Environmental sample submitted for chemical analysis.					
30									
35									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

▽ Water Level ()

▼ Water Level at time of drilling (ATD)

Logged by: KMA

Approved by: OKP

AESIBOR 180378V003.GPJ February 22, 2019

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP4	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/5/19,2/5/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist, slightly oxidized brown, gravelly, fine to medium SAND, trace to some silt (SP-GP).					
5				Moist, light brown, fine to medium SAND, some gravel, trace silt (SP).					
		S-2		As above; dark brown.					
10				Moist, slightly oxidized brown, fine to medium SAND, trace to some gravel, trace to some silt; massive (SP).					
		S-3		Moist, dark gray, fine to medium SAND, some gravel, trace silt (SP).					
15									
		S-4		As above; wet.		▼			
20				Bottom of exploration boring at 20 feet. Groundwater encountered at 19 feet.					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC
Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP5	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/5/19,2/5/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist, slightly oxidized light brown to brown, fine SAND, some gravel to gravelly, trace to some silt, trace fine organics, trace rootlets in top 1.5 feet (GP-SP).					
5				Moist to wet, grayish light brown, mostly fine to medium SAND, some gravel, some silt ranging to fine SAND, trace silt at 7 feet (SP).					
		S-2		As above; trace silt.					
				Peat					
				Very moist, dark brown, SILT, trace fine sand; abundant fine organics (rootlets/woody debris); strong peat odor (PT).					
				Recent Alluvium					
10				Moist, dark brown, silty, GRAVEL, some fine to medium sand; occasional fine organics (GM).					
		S-3		Very moist to wet, gray, fine to medium SAND, some gravel, trace silt (SP).		▼			
15				Bottom of exploration boring at 15 feet. Groundwater encountered at 13 feet.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: CJK

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP6	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/5/19,2/5/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist, moderately oxidized brown to dark brown, moist, gravelly, fine to medium SAND, trace silt; occasional charcoal (GP-SP).					
				As above.					
5				As above.					
				Moist to wet, light brown with slight oxidation banding, fine SAND, trace silt; occasional mica; massive (SP).		▼			
		S-2		**Peat**					
				Very moist to wet, dark brown, SILT, trace fine sand; abundant fine organics (rootlets/woody debris); strong organic odor (PT).					
				Recent Alluvium					
10				Very moist, slightly oxidized grayish brown, silty, GRAVEL, some fine sand; occasional fine organics (GM).					
				Bottom of exploration boring at 10 feet. Groundwater encountered at 6 feet.					
15									
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC
Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP7	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist, moderately oxidized brown, gravelly, fine to medium SAND, trace to some silt; unsorted (GP-SP).					
5				Moist, slightly oxidized light brown, fine SAND, trace silt; moderate mica; slightly stratified (SP).					
				As above; wet; oxidation banding.					
		S-2		Moist, moderately oxidized brown, sandy, GRAVEL, some silt; fine organics; occasional charcoal; interstices of silty fine to medium sand (GW).					
10				As above.					
		S-3		Moist to very moist, heavily oxidized light brown to dark orangish brown, medium SAND, trace silt; occasional mica; massive (SP).					
				Moist, light gray, sandy, GRAVEL, trace to some silt (GW).					
15				Bottom of exploration boring at 15 feet. No groundwater encountered.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC
Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP8	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
				Moist to very moist, moderately oxidized brown to light brown with depth, fine to medium SAND, some gravel, trace to some silt; unsorted (SP).					
		S-1							
5				As above.					
		S-2		Very moist to wet, slightly oxidized light brown, fine SAND, trace silt; moderate mica; massive (SP).		▼			
				Peat					
				Very moist, dark brown, SILT, trace sand; abundant fine organics; occasional woody debris; strong organic odor (PT).					
				Recent Alluvium					
10				Very moist, dark brown, silty, sandy, GRAVEL; fine organics; unsorted (GM).					
		S-3		As above; trace to some silt.					
				Moist to very moist, moderately oxidized, light to dark orangish brown, medium SAND, trace silt; occasional mica; massive (SP).					
				Moist, light brownish gray, gravelly, fine to medium SAND, trace to some silt (SP-GP).					
15				Bottom of exploration boring at 15 feet. Groundwater encountered at 7 feet.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC
Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP9	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist to very moist, moderately oxidized light brown to brown, fine to medium SAND, some gravel, trace silt; unsorted (SP-GP).					
5				As above; lens of light brown, fine sand, some gravel (SP).					
		S-2		As above; becomes light brown, some gravel (SP).					
10									
		S-3		Moist to very moist, moderately oxidized light brown, fine to medium SAND, some gravel, trace silt; unsorted (SP).					
				Very moist to wet, brown, sandy, silty, GRAVEL; moderate fine organics; unsorted (GM).		▼			
15									
		S-4		Moist to very moist, heavily oxidized orangish dark brown, medium SAND, trace gravel, trace silt; occasional mica; massive (SP).					
				Moist, light to dark gray, gravelly, fine to medium SAND, trace to some silt; unsorted (SP-GP).					
20				Bottom of exploration boring at 20 feet. Groundwater encountered at 14 feet.					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP10	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Very moist, moderately oxidized brown, gravelly, fine SAND, trace some silt; unsorted (SP-GP).					
5				Moist to very moist, slightly oxidized light brown, fine to medium SAND, some gravel, trace to some silt; unsorted (SP).					
		S-2		As above; ranges to silty, trace gravel (SM).					
10				As above; some gravel, trace silt (SP).					
		S-3							
15				Bottom of exploration boring at 15 feet. No groundwater encountered.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC
Approved by: CJK

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP11	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist, moderately oxidized brown, fine to medium SAND, some gravel, trace silt; unsorted (SP).					
				Peat					
				Very moist, dark brown, SILT, trace to some fine sand; abundant fine organics; interbeds of light gray silt; occasional mica (PT).					
5				**Recent Alluvium**					
				Very moist, slightly oxidized light brown, fine SAND, trace silt; slightly stratified; lens of dark brown silt; abundant fine organics (peat lens); moderate mica (SP-SM).					
		S-2		**Peat**					
				Very moist, dark brown, SILT, trace sand, trace gravel; abundant fine organics (PT).					
				Recent Alluvium					
				Moist, moderately oxidized orangish dark brown, gravelly, fine to medium SAND, trace silt ranging to sandy, GRAVEL; unsorted (GM).					
10									
		S-3		Moist, heavily oxidized light brown, medium SAND, trace silt, trace gravel; occasional mica; massive (SP).					
15				Bottom of exploration boring at 15 feet. No groundwater encountered.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: CJK

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP12	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Fill					
		S-1		Moist, moderately oxidized dark brown, fine to medium SAND, some silt, some gravel (SW).					
				As above; brick debris, abundant fine organics.					
				Recent Alluvium					
				Very moist, slightly oxidized light brown, fine SAND, trace silt; slightly stratified (SP).					
5									
		S-2		Moist, light brown to brown, fine to medium SAND, some gravel, trace silt (SP).					
				Poor recovery 5 to 10 feet due to abundant cobbles.					
10									
		S-3		Moist, moderately oxidized orangish brown, gravelly, fine to mostly medium SAND, trace silt, trace gravel with depth (GP-SP).					
15				Bottom of exploration boring at 15 feet. No groundwater encountered.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP13	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Fill					
		S-1		Moist, moderately oxidized dark brown, gravelly, fine SAND, some silt; abundant fine organics; occasional rootlets and brick debris; slight organic odor (GP-SP).					
				Recent Alluvium					
5				Very moist, slightly oxidized light brown, fine SAND, trace silt; slightly stratified (SP).					
		S-2		Moist, heavily oxidized orangish dark brown, medium SAND, some gravel; unsorted (SP).					
10				Moist, light brownish gray, sandy, GRAVEL, some silt (GP).					
		S-3		Poor recovery 10 to 15 feet due to abundant cobbles.					
15				Bottom of exploration boring at 15 feet. No groundwater encountered.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC
Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

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Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP14	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
				Moist, brown to light brown, fine to mostly medium SAND, some gravel, trace to some silt (SP).					
		S-1							
5				Very moist, slightly oxidized brown, fine SAND, trace silt; moderate mica; massive (SP).					
		S-2		Moist, heavily oxidized dark brown, fine to mostly medium SAND, some gravel; unsorted (SP).					
10									
		S-3							
				Moist, dark gray, medium SAND, trace gravel; massive (SP).					
15				Bottom of exploration boring at 15 feet. No groundwater encountered.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
180378E002	GP15	1 of 1

Project Name	Redmond Central	Ground Surface Elevation (ft)	~40
Location	Redmond, WA	Datum	NAVD 88
Driller/Equipment	Cascade Drilling / Geoprobe 7822DT Track Rig	Date Start/Finish	2/6/19,2/6/19
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	2

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil - 6 inches					
				Recent Alluvium					
		S-1		Moist to very moist, moderately oxidized brown, fine to medium SAND, some gravel to gravelly, some silt; unsorted (GP-SP).					
5				As above; abundant cobbles.					
		S-2		Very moist to wet, heavily oxidized orangish dark brown, fine to medium SAND, some gravel; massive to unsorted (SP).		▼			
10				Driller notes heavy decaying organic odor from groundwater.					
		S-3		Lens (2 inches thick) of sandy gravel.					
				Very moist to wet, slightly oxidized brown, fine to mostly medium SAND, some gravel, trace silt (SP).					
15				Bottom of exploration boring at 15 feet. Groundwater encountered at 7 feet.					
20									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

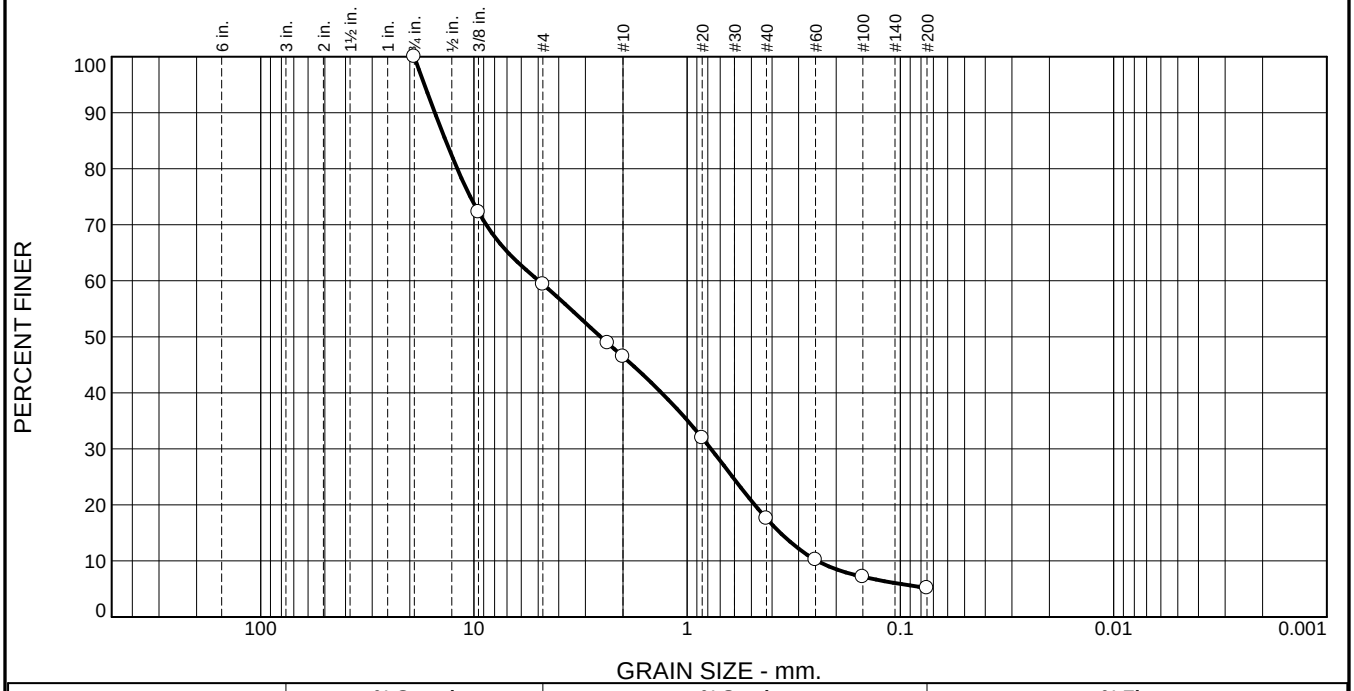
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: CRC

Approved by: CJK

AESIBOR 180378E001.GPJ March 19, 2019

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	40.6	12.9	28.9	12.4	5.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.375	72.3		
#4	59.4		
#8	48.9		
#10	46.5		
#20	31.9		
#40	17.6		
#60	10.2		
#100	7.2		
#200	5.2		

* (no specification provided)

Material Description

Very Gravelly SAND Some Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 15.2513 D_{85}= 13.5687 D_{60}= 4.9623
D_{50}= 2.5452 D_{30}= 0.7735 D_{15}= 0.3655
D_{10}= 0.2450 C_u= 20.25 C_c= 0.49

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

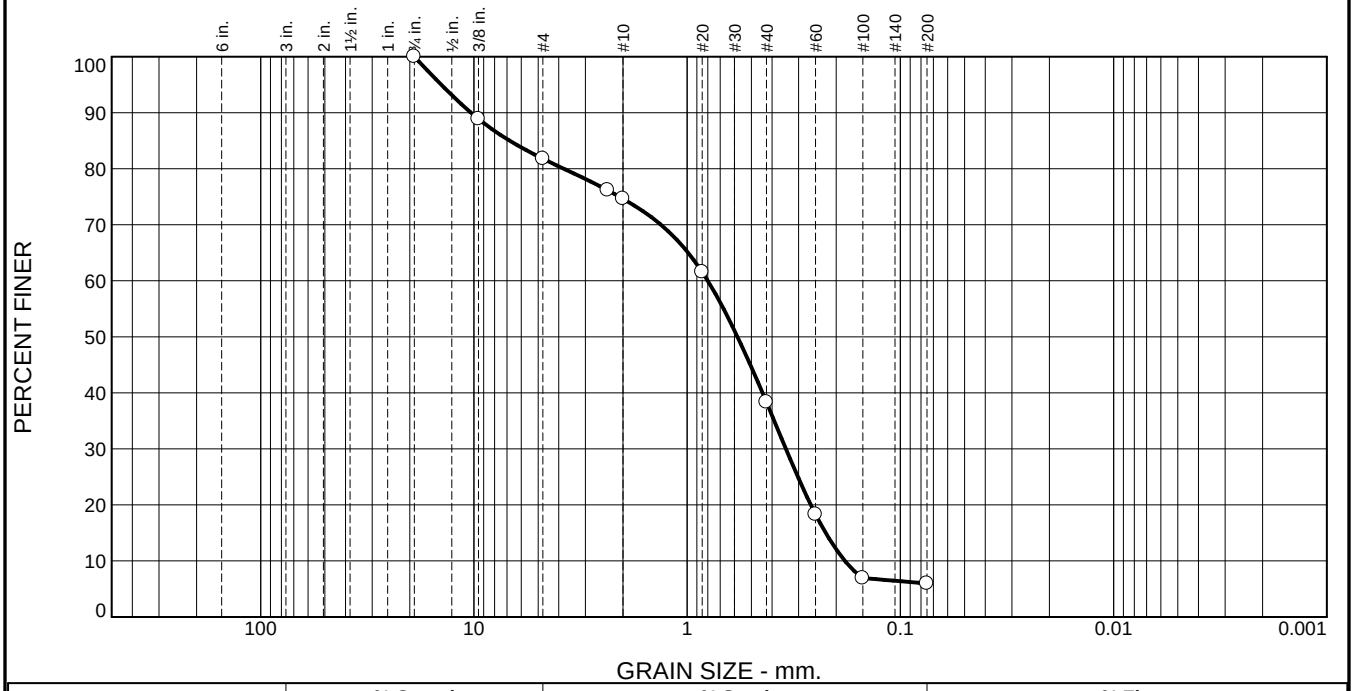
Location: Onsite **Date Sampled:** 8-6-18
Sample Number: EB2-S1 **Depth:** 2.5'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	18.2	7.2	36.3	32.3	6.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.375	88.9		
#4	81.8		
#8	76.2		
#10	74.6		
#20	61.6		
#40	38.3		
#60	18.3		
#100	6.9		
#200	6.0		

* (no specification provided)

Material Description

Gravelly SAND Some Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 10.3274 D_{85}= 6.7972 D_{60}= 0.8005
D_{50}= 0.5806 D_{30}= 0.3444 D_{15}= 0.2241
D_{10}= 0.1820 C_u= 4.40 C_c= 0.81

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

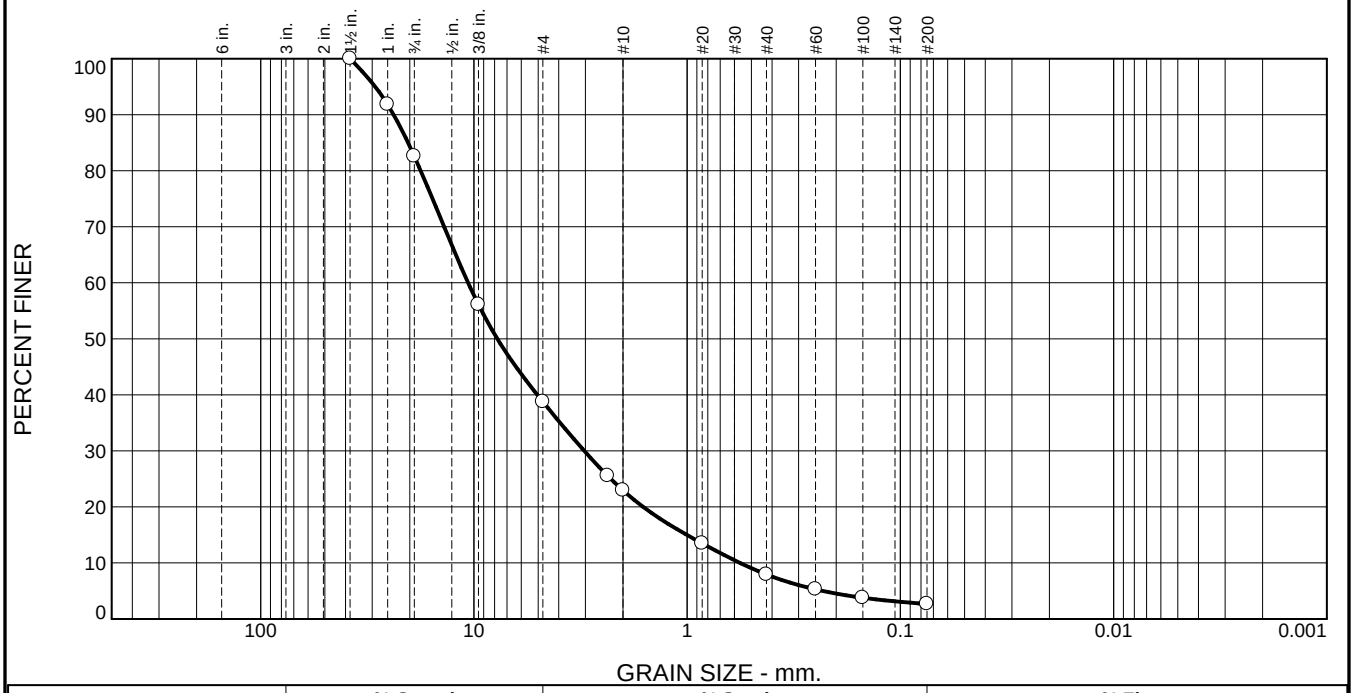
Location: Onsite **Date Sampled:** 8-6-18
Sample Number: EB2-S2 **Depth:** 4'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	17.4	43.8	15.9	15.0	5.2	2.7	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	91.8		
.75	82.6		
.375	56.1		
#4	38.8		
#8	25.5		
#10	22.9		
#20	13.5		
#40	7.9		
#60	5.3		
#100	3.8		
#200	2.7		

* (no specification provided)

Material Description

Very Sandy GRAVEL Trace Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= GW **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 23.7896 D_{85}= 20.3744 D_{60}= 10.6524
D_{50}= 7.7662 D_{30}= 3.0390 D_{15}= 1.0031
D_{10}= 0.5651 C_u= 18.85 C_c= 1.53

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

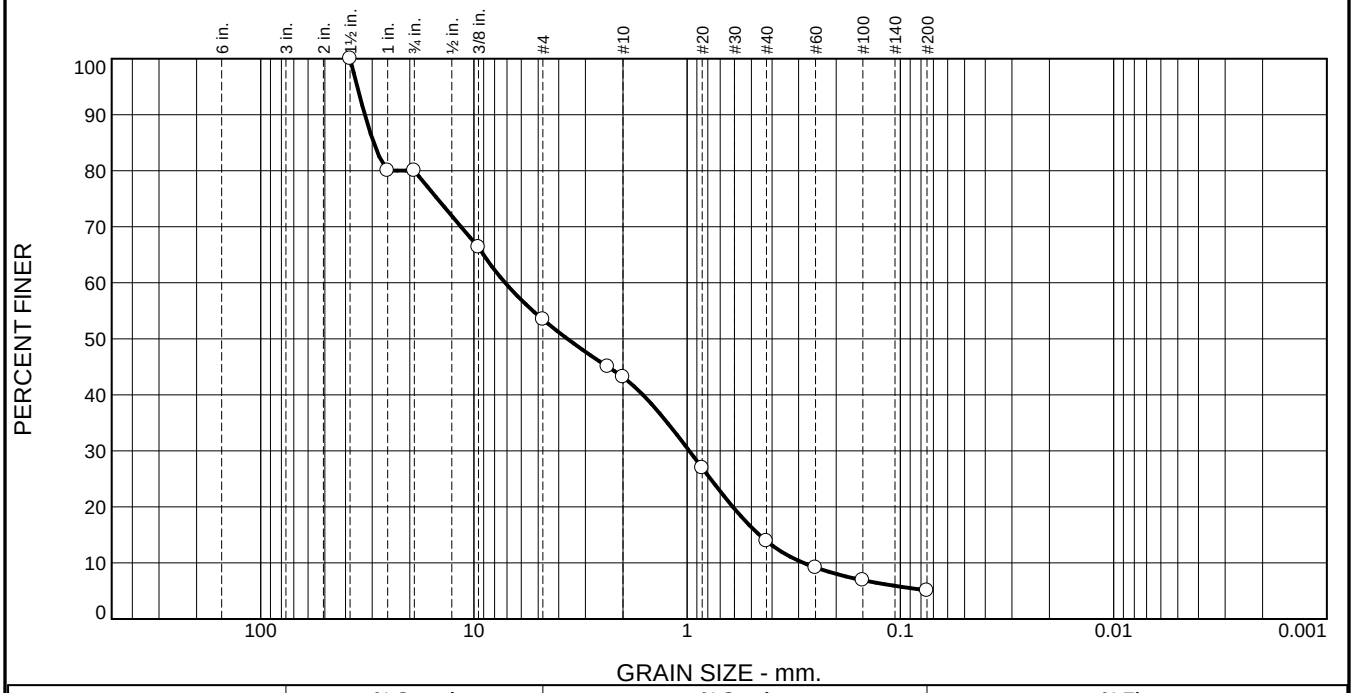
Location: Onsite **Date Sampled:** 8-6-18
Sample Number: EB2-S8 **Depth:** 34'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	20.0	26.5	10.3	29.3	8.8	5.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	80.0		
.75	80.0		
.375	66.4		
#4	53.5		
#8	45.0		
#10	43.2		
#20	26.9		
#40	13.9		
#60	9.2		
#100	6.9		
#200	5.1		

* (no specification provided)

Material Description

Very Gravelly SAND Some Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 32.4799 D_{85}= 29.5272 D_{60}= 7.1429
D_{50}= 3.6477 D_{30}= 0.9776 D_{15}= 0.4585
D_{10}= 0.2848 C_u= 25.08 C_c= 0.47

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

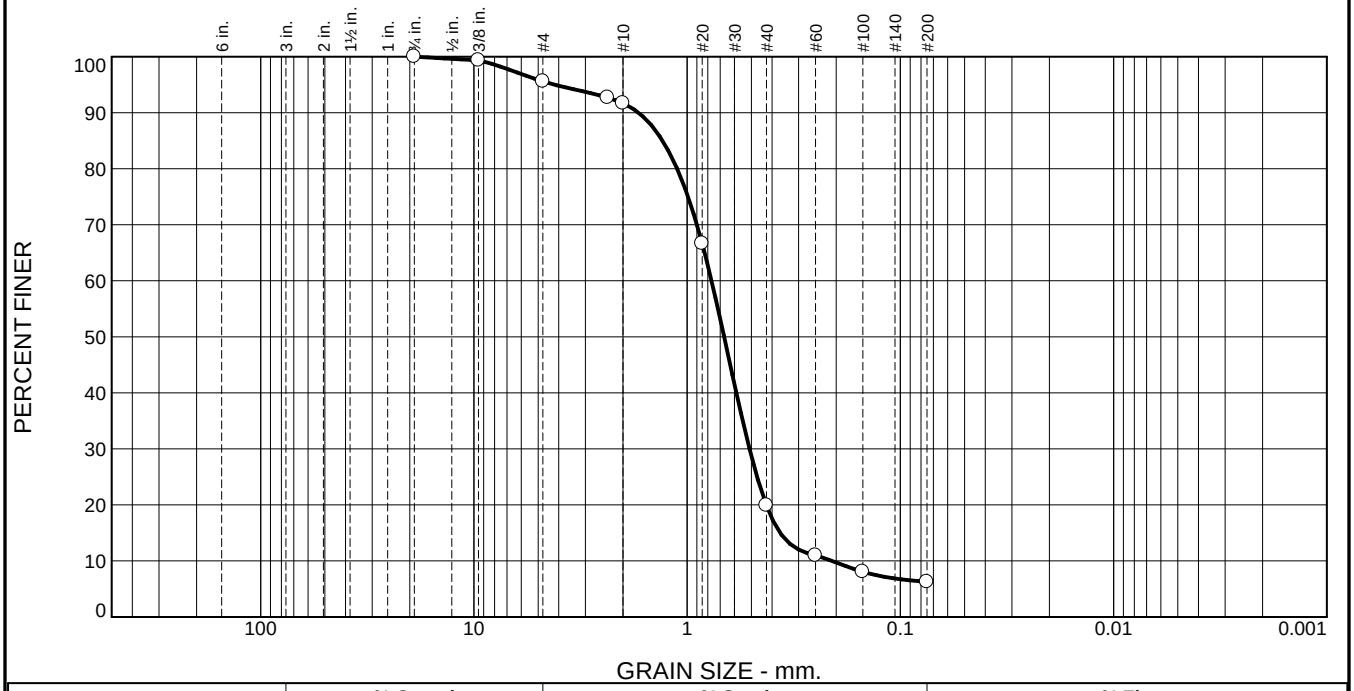
Location: Onsite **Date Sampled:** 8-6-18
Sample Number: EB2-S3 **Depth:** 9'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.4	3.9	71.8	13.6	6.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.375	99.3		
#4	95.6		
#8	92.7		
#10	91.7		
#20	66.7		
#40	19.9		
#60	11.0		
#100	8.1		
#200	6.3		

* (no specification provided)

Material Description

SAND Some Silt Trace Gravel

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 1.6920 D_{85}= 1.3046 D_{60}= 0.7687
D_{50}= 0.6709 D_{30}= 0.5099 D_{15}= 0.3664
D_{10}= 0.2096 C_u= 3.67 C_c= 1.61

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

Location: Onsite **Date Sampled:** 8-6-18

Sample Number: EB2-S4 **Depth:** 14'

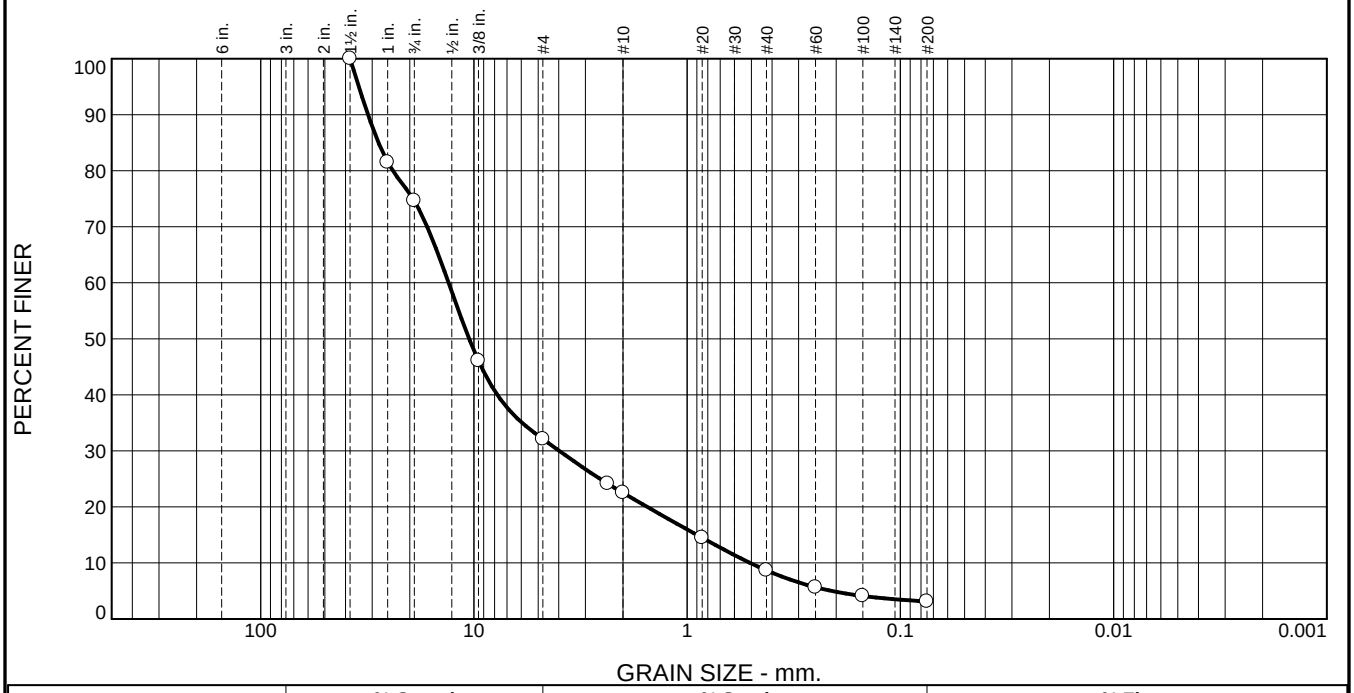
associated earth sciences incorporated

Client: Mainstreet Group

Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	25.4	42.5	9.6	13.8	5.6	3.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	81.5		
.75	74.6		
.375	46.1		
#4	32.1		
#8	24.2		
#10	22.5		
#20	14.5		
#40	8.7		
#60	5.7		
#100	4.1		
#200	3.1		

* (no specification provided)

Material Description

Sandy GRAVEL Trace Silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** NV **PI=**

Classification

USCS (D 2487)= GW **AASHTO (M 145)=**

Coefficients

D_{90}= 31.3752 D_{85}= 28.0279 D_{60}= 13.1503
D_{50}= 10.5290 D_{30}= 3.9799 D_{15}= 0.8994
D_{10}= 0.5066 C_u= 25.96 C_c= 2.38

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

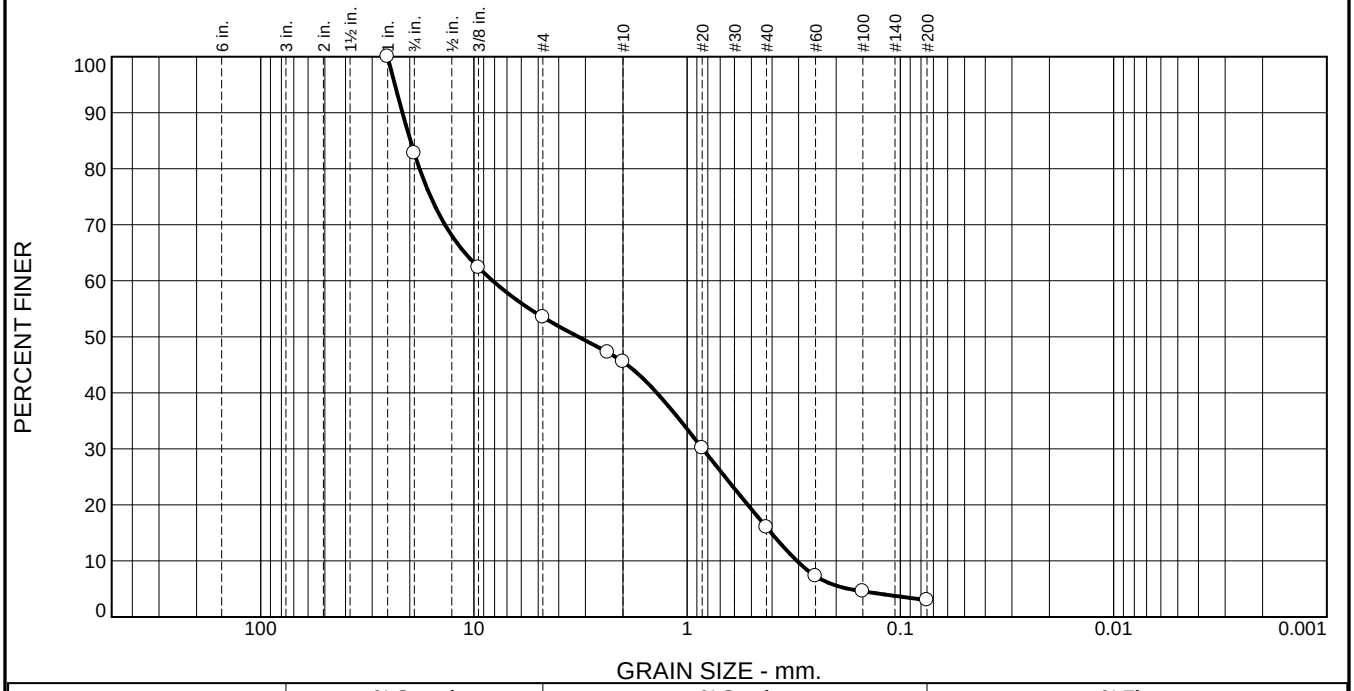
Location: Onsite **Date Sampled:** 8-6-18
Sample Number: EB2-S5 **Depth:** 19'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	17.2	29.3	8.0	29.5	13.0	3.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	82.8		
.375	62.4		
#4	53.5		
#8	47.2		
#10	45.5		
#20	30.1		
#40	16.0		
#60	7.3		
#100	4.6		
#200	3.0		

* (no specification provided)

Material Description

Very Gravelly SAND Trace Silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** NV **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 21.6583 D_{85}= 19.8585 D_{60}= 8.1629
D_{50}= 3.2350 D_{30}= 0.8448 D_{15}= 0.4033
D_{10}= 0.3055 C_u= 26.72 C_c= 0.29

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

Location: Onsite
Sample Number: EB2-S6 **Depth:** 24'

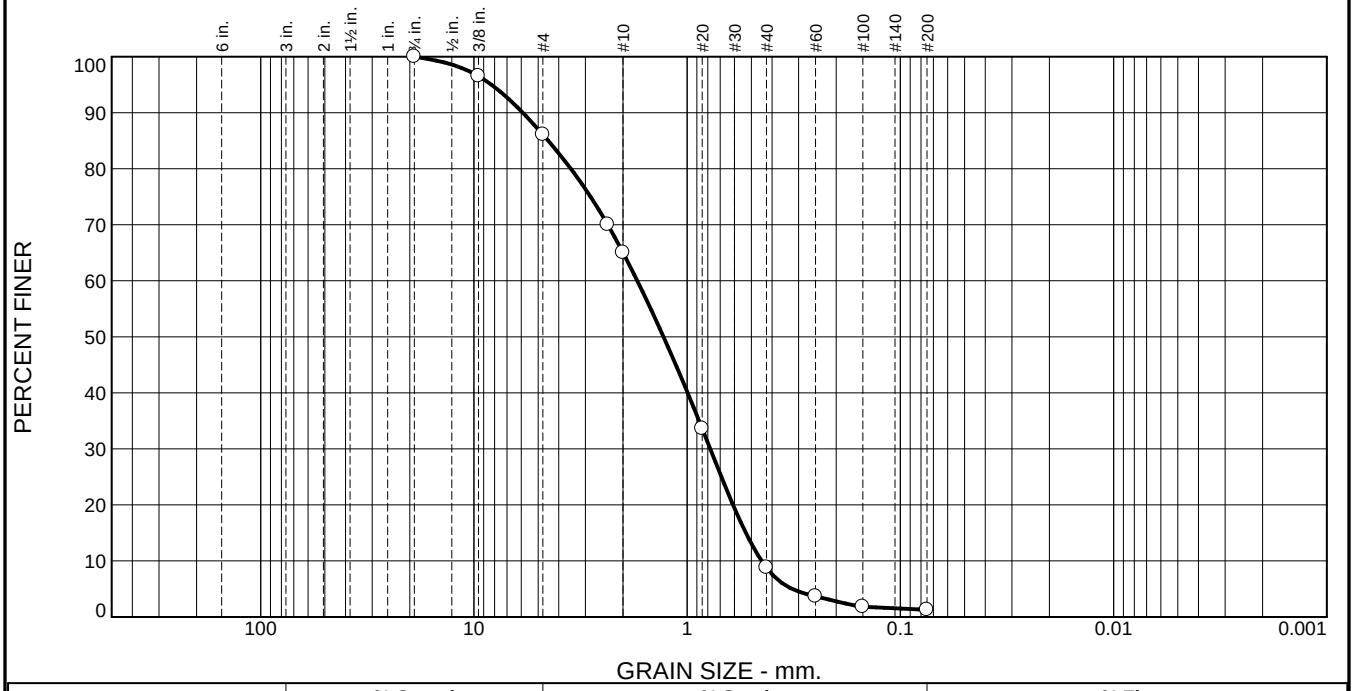
Date Sampled: 8-6-18

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.9	21.1	56.2	7.5	1.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.375	96.5		
#4	86.1		
#8	70.0		
#10	65.0		
#20	33.6		
#40	8.8		
#60	3.7		
#100	1.8		
#200	1.3		

* (no specification provided)

Material Description

Gravelly SAND Trace Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 5.9025 D_{85}= 4.4861 D_{60}= 1.7142
D_{50}= 1.2912 D_{30}= 0.7792 D_{15}= 0.5305
D_{10}= 0.4476 C_u= 3.83 C_c= 0.79

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

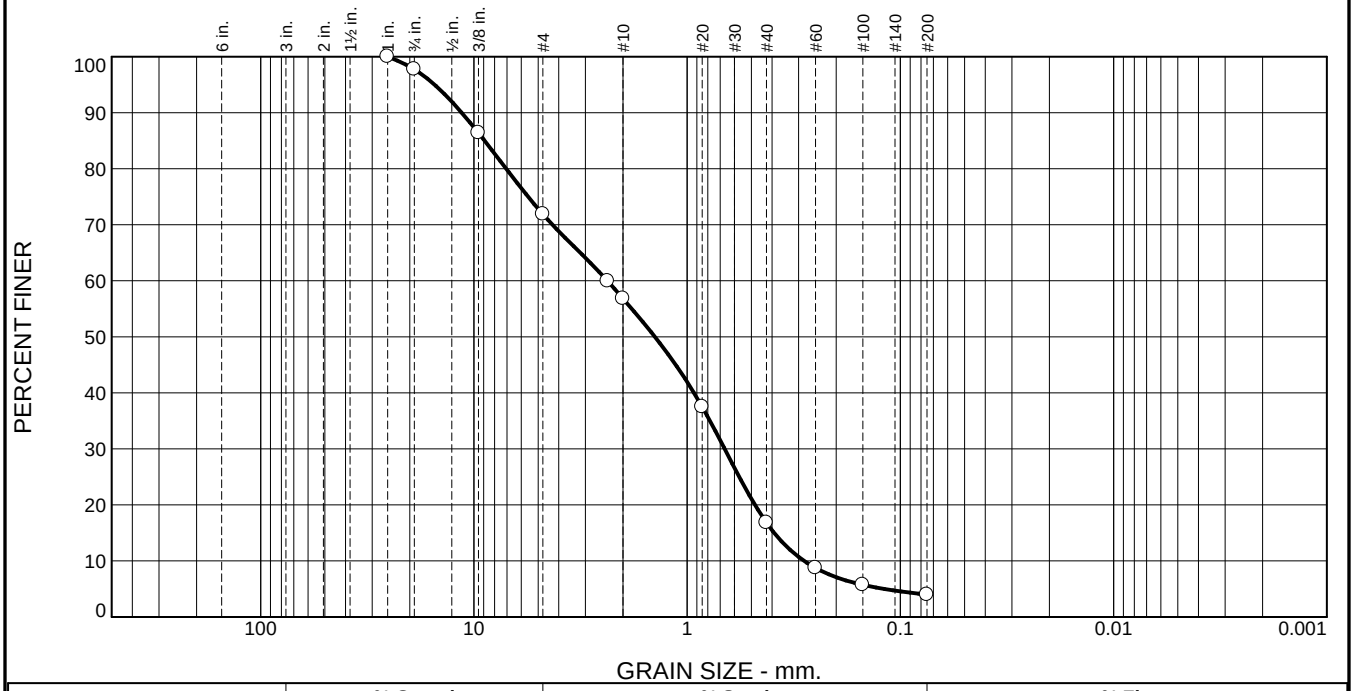
Location: Onsite **Date Sampled:** 8-6-13
Sample Number: EB2-S7 **Depth:** 29'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.2	25.9	15.1	40.0	12.8	4.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	97.8		
.375	86.4		
#4	71.9		
#8	60.0		
#10	56.8		
#20	37.5		
#40	16.8		
#60	8.8		
#100	5.7		
#200	4.0		

* (no specification provided)

Material Description

Gravelly SAND Trace Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 11.4133 D_{85}= 8.9147 D_{60}= 2.3661
D_{50}= 1.4179 D_{30}= 0.6671 D_{15}= 0.3909
D_{10}= 0.2829 C_u= 8.36 C_c= 0.66

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

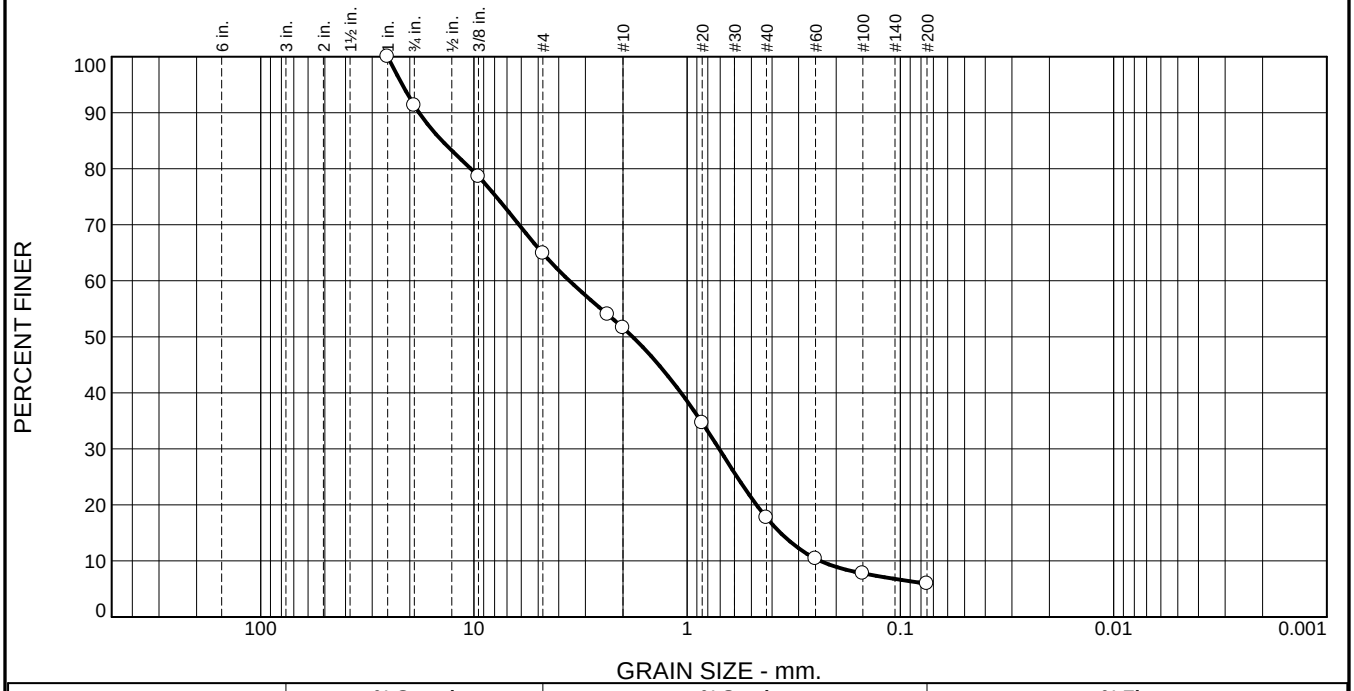
Location: Onsite **Date Sampled:** 8-6-18
Sample Number: EB2-S9 **Depth:** 39'

associated earth sciences incorporated

Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.7	26.4	13.3	33.9	11.8	5.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	91.3		
.375	78.6		
#4	64.9		
#8	54.0		
#10	51.6		
#20	34.6		
#40	17.7		
#60	10.4		
#100	7.8		
#200	5.9		

* (no specification provided)

Material Description

Very Gravelly SAND Some Silt

Atterberg Limits (ASTM D 4318)

PL= np **LL=** nv **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 18.0755 D_{85}= 14.1201 D_{60}= 3.5673
D_{50}= 1.8018 D_{30}= 0.7082 D_{15}= 0.3651
D_{10}= 0.2376 C_u= 15.01 C_c= 0.59

Remarks

Date Received: 8-13-18 **Date Tested:** 8-13-18

Tested By: MS

Checked By: BG

Title:

Location: Onsite
Sample Number: EB2-S10 **Depth:** 44'

Date Sampled: 8-6-18

associated earth sciences incorporated

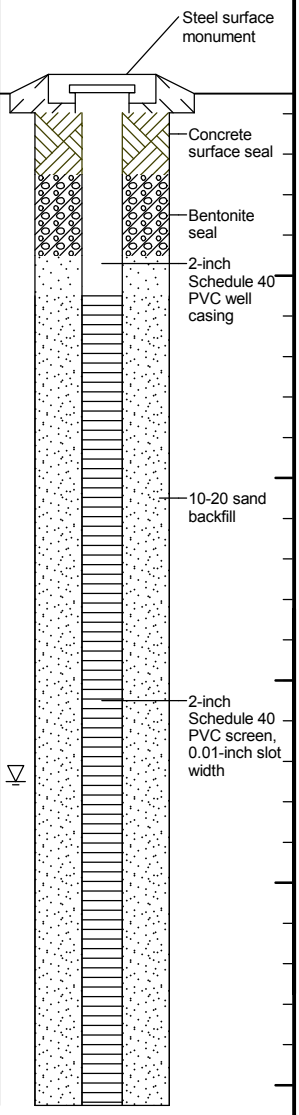
Client: Mainstreet Group
Project: Redmond Central

Project No: 180378 V002 **Figure**

Date(s) Drilled	07/21/07	Logged By	SHL	Checked By	GJA
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4-inch ID Hollow-stem Auger	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	Truck-mounted Drill Rig
Total Well Depth (ft)	25	Ground Surface Elevation (ft)	39.5	Groundwater Elevation (ft)	22.5
Vertical Datum	NAVD88	Datum/ System	NAD83	Easting(x): Northing(y):	1321971 248615.2

Elevation feet	Depth feet	SAMPLES: Interval Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sub-Sample Sample Number	SAMPLES: Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV (ppm)
	0						AC	1 foot asphalt (continuous layer)		
							SW	Brown fine to coarse sand with gravel (medium dense/moist) (almost dry)		
		16	18	1					NS	<1
	5	16	13	2					NS	<1
		16	10	3					NS	<1
							SP	Brown medium to coarse sand with gravel (medium dense, moist)		
	10	16	9	4					NS	<1
		16	10	5					NS	<1
	15	16	14	6					NS	<1
		16	16	7	CA			Becomes wet	NS	<1
	20	14	13	8					NS	<1
		16	12	9					NS	<1
	25								NS	<1
	30									

WELL CONSTRUCTION



Note: See Figure C-1 for explanation of symbols.

LOG OF MONITORING WELL MW-088

GeoEngineers

Project: Redmond Shopping Square
Project Location: Redmond, Washington
Project Number: 0500-164-00

Figure C-3
Sheet 1 of 1

V6_ENVWELL W:\REDMOND\PROJECTS\0050016 4\GINT\050013302-BEAR CREEK.GPJ GEIV6_1.GDT 4/6/10

Drilled Start	End	Total Depth (ft)	Logged By / Checked By	Driller	Drilling Method
6/29/2009	6/29/2009	20	ARJ / JAS	Cascade	Direct Push, Air Knife

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
Undetermined		Direct Push, Air Knife

Easting (X) Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
		6/29/2009	10.5	Undetermined

Notes: Air-knife used from approximately 0 to 5 feet bgs. Grab soil samples were obtained using a hand auger.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	3 inches asphalt			
								SW	Brown fine to coarse sand with gravel and trace silt (medium dense, moist)			
					1					NS	<10	
								PT	Brown peat with occasional fine gravel (soft, moist)			
					2					NS	<10	
	5											
									Brown peat (soft, moist)			
					3					NS	<10	
					4					NS	<10	
	10				5 CA	▽				NS	<10	
								SM	Gray silty fine sand (medium dense, wet)			
					6					NS	<10	
					7				Gray fine sand	NS	<10	
	15											
					8					NS	<10	
								SW	Gray fine to medium sand with gravel (wet)			
					9					NS	<10	
					10					NS	<10	
	20											

Note: See Figure B-1 for explanation of symbols.

Log of Boring B-6

GeoEngineers

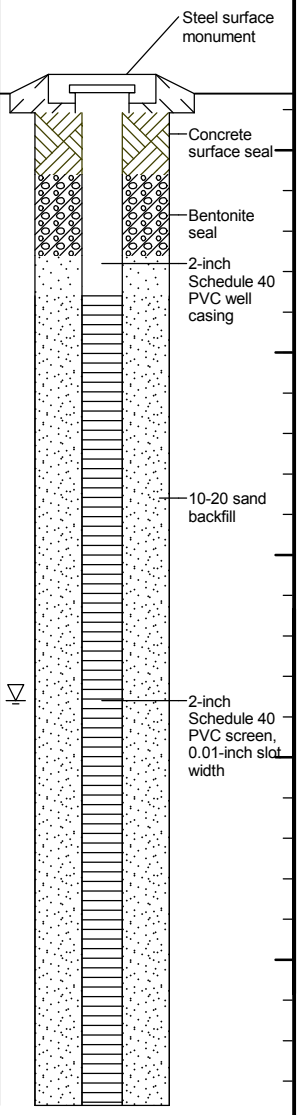
Project: Redmond Shopping Square, Redmond, Washington
Project Location: 16101-16149 NE Redmond Way
Project Number: 0500-158-00

Figure B-7
Sheet 1 of 1

Date(s) Drilled	07/21/07	Logged By	SHL	Checked By	GJA
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4-inch ID Hollow-stem Auger	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	Truck-mounted Drill Rig
Total Well Depth (ft)	25	Ground Surface Elevation (ft)	41.4	Groundwater Elevation (ft)	26.4
Vertical Datum	NAVD88	Datum/ System	NAD83	Easting(x): Northing(y):	1321936.6 248648.1

Elevation feet	Depth feet	SAMPLES Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV (ppm)
	0							AC	1 foot asphalt		
								SP	Brown medium to coarse sand with gravel (medium dense, moist)		
			16		1				Cobbles at 2 feet	SS	<1
	5		16	13	2					NS	<1
			16	11	3					NS	<1
	10		16	10	4					NS	<1
			16	11	5	CA				NS	<1
	15		16	26	6					NS	<1
								GP	Fine to coarse gravel with sand (medium dense, wet)		
			16	18	7					NS	<1
								SP	Brown coarse sand (medium dense, wet)		
	20		16	24	8					NS	<1
			12	19	9					NS	<1
	25										
	30										

WELL CONSTRUCTION



Note: See Figure C-1 for explanation of symbols.

LOG OF MONITORING WELL MW-089

GeoEngineers

Project: Redmond Shopping Square
Project Location: Redmond, Washington
Project Number: 0500-164-00

Figure C-4
Sheet 1 of 1

V6_ENVWELL W:\REDMOND\PROJECTS\0050016 4\GINT\050013302-BEAR CREEK.GPJ GEIV6_1.GDT 4/6/10

Drilled Start 6/30/2009 End 6/30/2009	Total Depth (ft) 20	Logged By ARJ Checked By JAS	Driller Cascade	Drilling Method Direct Push, Air Knife
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data		Drilling Equipment Direct Push, Air Knife
Easting (X) Northing (Y)		System Datum		Groundwater Date Measured 6/30/2009 Depth to Water (ft) Not Encountered Elevation (ft)

Notes: Air-knife used from approximately 0 to 5 feet bgs. Grab soil samples were obtained using a hand auger.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	FIELD DATA: Blows/foot	FIELD DATA: Collected Sample	FIELD DATA: Sample Name Testing	FIELD DATA: Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							SP	Brown fine to medium sand with gravel (medium dense, moist)			
					1					NS	<10	
												No sample obtained due to cobbles.
	5								Brown medium sand (moist)			
					2					NS	<10	
					3					NS	<10	
									No Recovery to base of boring			No recovery between 9 and 20 feet bgs due to coarse gravel. Obtained groundwater sample only.
	10					▽						
	15											
	20											

Note: See Figure B-1 for explanation of symbols.

Log of Boring B-12

GeoEngineers

Project: Redmond Shopping Square, Redmond, Washington
Project Location: 16101-16149 NE Redmond Way
Project Number: 0500-158-00

Figure B-13
Sheet 1 of 1

Drilled Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
6/30/2009	6/30/2009	20	ARJ	JAS	Cascade	Direct Push, Air Knife

Surface Elevation (ft) Vertical Datum	Hammer Data	Drilling Equipment
Undetermined		Direct Push, Air Knife

Easting (X) Northing (Y)	System Datum	Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
		6/30/2009	14.5	Undetermined

Notes: Air-knife used from approximately 0 to 5 feet bgs. Grab soil samples were obtained using a hand auger.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0							AC	3 inches asphalt			
								GP	Coarse gravel and cobbles			
								SM	Brown silty fine to medium sand with gravel and cobbles (moist)			No sample obtained due to rocks.
					1					NS	<10	
	5											
					2			SP	Brown medium sand (medium dense, moist)	NS	<10	
					3					NS	<10	
	10				4					NS	<10	
					5					NS	<10	
					6	▽			Gray medium sand with occasional gravel (medium dense, moist)	NS	<10	
	15								Gray medium sand with occasional gravel (medium dense, wet)			
					7					NS	<10	
	20											

Note: See Figure B-1 for explanation of symbols.

Log of Boring B-11

GeoEngineers

Project: Redmond Shopping Square, Redmond, Washington
Project Location: 16101-16149 NE Redmond Way
Project Number: 0500-158-00

Figure B-12
Sheet 1 of 1

Drilled Start 6/29/2009 End 6/29/2009	Total Depth (ft) 20	Logged By ARJ Checked By JAS	Driller Cascade	Drilling Method Direct Push	
Surface Elevation (ft) Vertical Datum Undetermined		Hammer Data		Drilling Equipment Direct Push Truck Mount	
Easting (X) Northing (Y)		System Datum		Groundwater Date Measured 6/29/2009	Depth to Water (ft) 13.0 / Elevation (ft) Undetermined

Notes: Air-knife used from approximately 0 to 5 feet bgs. Grab soil samples were obtained using a hand auger.

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample / Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0						AC	3 inches asphalt			
							SM	Brown silty fine to medium sand with gravel (medium dense, moist)			
				1					NS	<10	
				2					NS	<10	
	5						PT	Brown peat with 3-inch gray fine sand lense (soft, moist)			
				3					NS	<10	
				4				Brown peat with 1/2-inch interbedded gray fine sand lenses (soft, moist)	NS	<10	
	10			5				Brown peat (soft, moist)	NS	<10	
							SP	Fine gray sand (medium dense, very moist)			
				6	▽				NS	<10	
				7				Gray medium sand (wet)	NS	<10	
	15			8				Gray medium sand with angular gravel (wet)	NS	<10	
				9					NS	<10	
	20			10				No recovery	NS	<10	

Note: See Figure B-1 for explanation of symbols.

Log of Boring B-5

GeoEngineers

Project: Redmond Shopping Square, Redmond, Washington
Project Location: 16101-16149 NE Redmond Way
Project Number: 0500-158-00

Figure B-6
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	2/1/2010	2/1/2010	26.5	BHC	DPC	Boretec	Hollow Stem Auger

Hammer Data	Rope & Cathead 140 (lbs) / 30 (in) Drop	Drilling Equipment	Volvo EC 55
Surface Elevation (ft) Vertical Datum	38.5 NAVD88	Top of Casing Elevation (ft)	38.0
Easting (X) Northing (Y)	1322037.4 248797.9	Horizontal Datum	NAD83

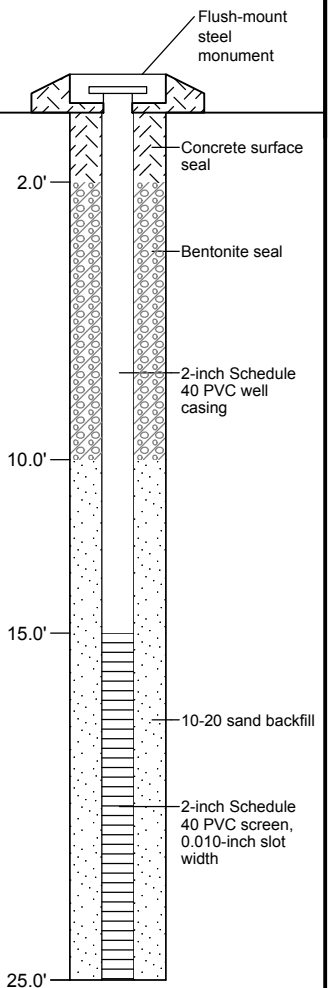
A 2 (in) well was installed on 2/1/2010 to a depth of 25 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
2/1/2010	12.0	26.50

Notes:

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Moisture Content %
	0								AC	7 inches of asphalt concrete pavement		
									SM	Dark brown silty fine to coarse sand with gravel (loose to medium dense, moist) (fill)		
35			6	10		1					NS	17
	5		6	6		2			SM	Gray silty fine to medium sand with gravel and trace organics (loose, moist)	NS	22
									OL/ML	Dark brown organic silt (medium stiff, moist)		
30												
	10		2	23		3	▼		SM	Dark brown silty fine to coarse sand with gravel and occasional cobbles (medium dense, moist to wet)	NS	
25												
	15		6	11		4			SP	Gray fine to coarse sand with gravel, trace silt and occasional cobbles (medium dense, wet)		20
20												
	20		5	16		5				Moderate heaving at 20 feet bgs		
15												
	25		6	15		6						

WELL LOG



Note: Please see Figure A-1 for explanation of symbols

Log of Monitoring Well MW-343

GeoEngineers

Project: 161st Ave NE Ext - Bear Crk Pkwy to Redmond Way
Project Location: Redmond, Washington
Project Number: 0500-164-00

Figure A-2
Sheet 1 of 1

Redmond: Date:4/6/10 Path:W:\REDMOND\PROJECTS\0\0500164\GINT\0500164400.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_WELL